UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

SUBJECT: final submittal

FROM: Jill Webster

TO: docket

The final submittal was received, on publication date of NPR.

Pennsylvania Department of Environmental Protection

Rachel Carson State Office Building
P.O. Box 2063
Harrisburg, PA 17105-2063

May 21, 2001

Office of the Secretary

E-mail: DavidHess@state.pa.us
Phone: 717-787-2814

Mr. Thomas C. Voltaggio
Acting Regional Administrator
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Dear Mr. Voltaggio:

Enclosed for your approval are five copies of the "Pittsburgh-Beaver Valley Area Ozone Maintenance Plan and Request for Redesignation as Attainment for Ozone". This is submitted as a revision to the Pennsylvania State Implementation Plan (SIP) in accordance with Sections 107(d) and 175(a) of the Clean Air Act. As part of this plan, Pennsylvania will prepare a second ten year plan for submission to EPA within eight years after the redesignation process has been completed as required by 175A (b) of the Clean Air Act.

Should you have any questions regarding these SIP revisions, please contact James M. Salvaggio, Director of our Bureau of Air Quality at 717-787-9702.

Sincerely,

David E. Hess
Acting Secretary

Enclosures

Proposed Pittsburgh-Beaver Valley Area Ozone Maintenance Plan and Request for Redesignation as Attainment for Ozone

Comment and Response Document

May 15, 2001

Bureau of Air Quality
Department of Environmental Protection

PROPOSED PITTSBURGH-BEAVER VALLEY AREA OZONE MAINTENANCE PLAN AND REQUEST FOR REDESIGNATION AS ATTAINMENT FOR OZONE

Comment and Response Document

The Department of Environmental Protection published a notice of comment period on March 31, 2001 in the Pennsylvania Bulletin (31 *Pennsylvania Bulletin* 1808). The public comment period closed on May 2, 2001.

This document summarized the comments received during the public comment period. Comments have been summarized and consolidated. A response to each comment is provided. Please note the number in parenthesis after each comment refers to the number of the commentator.

List of Commentators

Number	Commentator
1	Nancy F. Parks, Chair Clean Air Committee Pennsylvania Chapter Sierra Club 201 West Aaron Square P.O. Box 120 Aaronsburg, PA 16820-0120
2	Suzanne Seppi Executive Director Group Against Smog and Pollution P.O. Box 5165 Pittsburgh, PA 15206
3	Harold D. Miller Director The Southwestern Pennsylvania Growth Alliance 425 Sixth Avenue Suite 1000 Pittsburgh, PA 15219
4	Francis W. Jackson 110 Summit Ave Hatboro, PA 19040

RESPONSE TO COMMENTS

1. While no violations of the National Ambient Air Quality Standard (NAAQ) were measured, the area has recorded exceedances and has not been consistently under the NAAQS. Therefore, the Pittsburgh-Beaver Valley area should not be redesignated to attainment for the one-hour ozone standard. (1, 2)

   Response: It is correct that several monitors have measured exceedances of the one-hour standard. However, as shown in Figure 1-2 the number of exceedances continues to decrease in spite of the increase in the number of monitoring sites. The one-hour ozone standard allows up to three exceedances at a monitor over the three-year assessment period. The data analysis was completed using the appropriate regulations and guidance documents. This data and its analysis, demonstrates that the ozone strategies put in place by the Commonwealth, in partnership with the U.S. Environmental Protection Agency (EPA) and local stakeholders, have resulted in long-term improvement of air quality in the Pittsburgh area even during hot summer periods like 1999. More importantly, this data and its analysis supports the Commonwealth's redesignation request because it meets the Clean Air Act's legal requirements for redesignation. Consequently, there is no legal or scientific reason why the area should not be redesignated.

2. The area is only attaining because of the cool summer of 2000. The data presented in the Maintenance Plan show a warming trend and thus the area may go back into nonattainment. (1, 2)

   Response: EPA defined the legal attainment standard to be a three-year average. This three-year average takes into account the impact of hot and/or cool seasons may have on an area's ability to achieve the one-hour standard. For example, 1999 was a hot summer and 2000 was a cool summer. The three-year period of 1998-2000 therefore is representative of typical three-year periods where the potential for ozone formation varies. If the area measures exceedances of the one-hour standard, the Commonwealth will evaluate whether any further emission control measures should be implemented as outlined in the Maintenance Plan.

3. Will the emission reduction strategies applicable in 1999 remain in force through 2011? They need to be permanent and enforceable. (1, 2)

   Response: All of the control measures used for the 1999 inventory and for the future inventories are permanent and legally enforceable. It is these measures that contributed to the reductions in ozone precursor emissions and are responsible, in large part, for the Pittsburgh area's improved air quality. These measures are either federal EPA rules or are legally adopted by Pennsylvania with EPA approval as part of the Pennsylvania SIP or are pending EPA approval. Any changes would need to go through Pennsylvania's regulatory adoption process and be approved by EPA as a SIP revision.

4. The NOx SIP Call will not be implemented until 2004 and Pennsylvania relies on these reductions for attainment and maintenance; some states have missed NOx submittal deadlines; and Pennsylvania's Chapter 145 rules have been legally challenged. (2)

   Response: Pennsylvania recognizes that interstate ozone transport significantly contributes to the Pittsburgh area's inability to attain and maintain the one-hour standard and has acted to assure those reductions through its Section 126 petition filed on August 14, 1997 and as an active participant in federal litigation in the cases of Appalachian Power Company v. EPA and State of Michigan v. EPA. The Section 126 remedy establishes a 2003 implementation date. If a State fails to establish SIP based programs under the NOx SIP Call, EPA will impose a Federal Implementation Plan under Section 110 (42 U.S.C.§7410) of the Clean Air Act. The regulations under 25 Pa. Code Chapter 145 have not been legally challenged. Pennsylvania has issued permits under this rule to all applicable facilities and has submitted the regulations to EPA as a SIP amendment.

5. The auto inspection and maintenance emission-testing (I/M) program may be changed by the Pennsylvania General Assembly and is under review by an Emissions Policy Review Group, which may recommend changes to the current program. Therefore the program cannot be considered permanent and enforceable, Pennsylvania cannot honestly take these reductions into account, and any changes would invalidate the SIP and redesignation request. (1, 2)

   Response: As stated above in comment 3, all of the control measures used for the 1999 inventory and for the future inventories are permanent and enforceable including the I/M program in the Pittsburgh-Beaver Valley Area. This program is legally adopted by Pennsylvania with EPA approval as part of the Pennsylvania SIP. As a result, Pennsylvania can take these reductions into account under this plan. EPA has recently promulgated new regulations in the I/M program area and has required States to implement these changes. It is anticipated that these changes will not result in the loss of emission reductions, which would require a reevaluate of the SIP and maintenance plan. As required, PA is moving to meet these new additional federal requirements, which include onboard diagnostic testing of 1996 and newer vehicles. Any changes to the I/M program under this plan would need to go through an approval process that includes PA's regulatory adoption process and EPA's SIP revision process. Both of these processes require public participation. In addition, the Department is working with the General Assembly attempting to assure that any legislation meets the air quality needs of the area. .

6. Growth in the energy sector may adversely impact maintenance including permit requests pending for new diesel engines as peaking units and a new source power station permit for the Springdale area. How many permits have been requested? These sources should all be required to obtain offsets. (1, 2)

Response: There have been no permits issued for emergency generators in the Southwest Pennsylvania region including Allegheny County. However, several exemptions from plan approval under Section 127.14 of the Rules and Regulations have been granted for emergency generators that cannot be used as peaking units. Where such units are located at Major Stationary Sources they are included in the permit. The new power station at Springdale has been evaluated under the New Source Review (NSR) program, offsets have been obtained and Lowest Achievable Emission Rate (LAER) will be met. The same NSR requirements would apply to other new power stations. The Department will continue to evaluate the effectiveness of current NOx regulations to assure growth in the energy sector does not adversely impact attainment.

7. Contingency measures should be adopted prior to redesignation in order to be immediately applicable and permanent; the measure should also be quantified; these measures should be implemented if modeling shows violations. (2)

Response: Section 175A (d) of the CAA does not require that the contingency measures be adopted, quantified, or implemented because modeling shows a violation. Pennsylvania will track the attainment status of the area by reviewing air quality and emissions data during the maintenance period. Beginning in 2002, and every 3 years thereafter, Pennsylvania will develop and then evaluate periodic emission inventories to see if they exceed the 1999 baseline by 10%. Contingency measures may be implemented if either a 10% inventory increase or NAAQS ozone exceedances occur. Pennsylvania believes that this approach is sound because the appropriate remedy can be implemented after the problem has been assessed.

8. The region has been designated nonattainment for the new eight-hour ozone standard. (2)

Response: The region has not been designated as an eight-hour nonattainment area. Pennsylvania has proposed to EPA that the area be considered for nonattainment designation under the eight-hour standard when all of the legal issues related to the U.S. Supreme Court decision in Whitman v. American Trucking Associations (U.S., 99-1257, 2/27/01) are resolved. EPA has indicated that no formal designations will occur until at least a year after they have developed the implementation regulations for the standard as required by the recent Supreme Court ruling. As a result, Pennsylvania believes it is prudent to move forward with the one-hour redesignation request since ozone levels are below the standard and all of the requirements have been met.

9. The Plan takes credit for future reductions from programs not yet implemented. (1,2)

Response: Under existing regulations a State's SIP is allowed to take credit for regulations that have been legally adopted but that are not yet implemented. The reason for this practice is that the SIP and regulations are the plan for attainment and maintenance in a future year.

10. PA should not remove any ozone monitors. (1)

Response: Pennsylvania does not, at this time, plan to remove any ozone monitors. In fact the number of monitors in the area has been steadily increasing over the years. (See Table 1-1 from the Maintenance Plan)

11. DEP is considering additional ozone reduction strategies for the Philadelphia area. These strategies should be considered statewide. (1)

Response: The Commonwealth agrees that these strategies should be considered for adoption statewide and is discussing this with the Air Quality Technical Advisory Committee. However, any final decision related to the implementation of these strategies will be made after they go through the notice and comment rulemaking procedure.

12. The redesignation report should evaluate the effectiveness and necessity of each action and terminate ones that are not cost-effective. Tailpipe testing of vehicles covered by an On Board Diagnostic (OBD) program, tailpipe testing of all vehicles and gasoline vapor pressure requirements should be assessed for removal. (4)

Response: Evaluation of the current I/M program, including the addition/substitution of an OBD program for tailpipe testing, is under review by a Policy Review Group created by the Pennsylvania DEP and DOT. When completed, changes may be recommended. Any changes, as stated above in Comments 3 and 5, would need to be adopted and approved as SIP changes. The listed control options were evaluated as part of the ozone stakeholder process and found to be necessary for attainment. Cost-effectiveness evaluation is not a requirement for a maintenance plan or redesignation.

13. Strongly oppose redesignation. (1, 2)

Response: The Commonwealth disagrees and believes it is important to formally recognize the significant progress made by the Pittsburgh-Beaver Valley Area.

14. Strongly supports redesignation. (3, 4)

Response: The Commonwealth agrees.

NOTICES

Proposed Revision to the State Implementation Plan for Ozone for the Pittsburgh-Beaver Valley Ozone Nonattainment Area

[31 Pa.B. 1808]

Proposed Maintenance Plan

Public Hearing

Ground-level ozone concentrations above the Federal health-based standard are a serious human health threat and can also cause damage to crops, forests and wildlife. The Pittsburgh-Beaver Valley ozone nonattainment area (Allegheny, Armstrong, Beaver, Butler, Fayette, Washington and Westmoreland counties) has not experienced a violation of the 1-hour ozone standard for the past 3 years (1998-2000). Therefore, the Department of Environmental Protection (DEP) plans to submit a request to redesignate this area to "attainment." DEP is seeking public comment on this request and on a state implementation plan (SIP) revision setting forth a maintenance plan for the next 10 years. The maintenance plan, once found adequate by the Federal Environmental Protection Agency, will establish new motor vehicle emission budgets for purposes of transportation conformity.

This proposal is available on the DEP website at http://www.dep.state.pa.us (choose Information by Subject/Air Quality/State Implementation Plans), or through the contact person listed below.

The Department will hold a public hearing to receive comments on the SIP revision on Tuesday May 1, 2001, at 1 p.m. at the offices of the DEP Southwest Regional Office, Waterfront Room A, 500 Building, 500 Waterfront Drive, Pittsburgh, PA 15222-4745. The Department's Southwest Regional Office is located at Washington's Landing beneath the 31st Bridge along Pa. Route 28.

Persons wishing to present testimony at the hearing should contact Connie Cross, (717) 787-9495 (P. O. Box 8468, Harrisburg, PA 17105) to reserve a time. If a time is not reserved, individuals will be able to testify as time allows. Witnesses should keep testimony to 10 minutes and should provide two written copies at the hearing. Persons with a disability who wish to attend the hearing and require an auxiliary aid, service or other accommodation to participate in the proceeding should contact Wick Havens at the telephone above. TDD users may contact the AT&T Relay Service at (800) 654-5984 to discuss how the Department can best accommodate their needs.

Written comments should be sent to Wick Havens, Chief Division of Air Resource Management, Bureau of Air Quality, P. O. Box 8468, Harrisburg, PA 17105-8468 no later than noon on May 2, 2001.

JAMES M. SEIF,
Secretary

[Pa.B. Doc. No. 01-554. Filed for public inspection March 30, 2001, 9:00 a.m.]

{/h5}

COMMONWEALTH OF PENNSYLVANIA
STD—521 REV. 12-88

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PROPOSED REVISION TO THE STATE IMPLEMENTATION PLAN FOR OZONE FOR THE PITTSBURGH-BEAVER VALLEY OZONE NONATTAINMENT AREA

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PROPOSED REVISION TO THE STATE IMPLEMENTATION PLAN FOR OZONE FOR THE PITTSBURGH-BEAVER VALLEY OZONE NONATTAINMENT AREA

PROPOSED MAINTENANCE PLAN

Public Hearing

Ground-level ozone concentrations above the federal health-based standard are a serious human health threat and can also cause damage to crops, forests and wildlife. The Pittsburgh-Beaver Valley ozone nonattainment area (Allegheny, Armstrong, Beaver, Butler, Fayette, Washington and Westmoreland counties) has not experienced a violation of the one-hour ozone standard for the past three years (1998-2000). Therefore, the Pennsylvania Department of Environmental Protection (DEP) plans to submit a request to redesignate this area to attainment. DEP is seeking public comment on this request and on a state implementation plan (SIP) revision setting forth a maintenance plan for the next 10 years. The maintenance plan, once found adequate by the federal Environmental Protection Agency, will establish new motor vehicle emission budgets for purposes of transportation conformity.

This proposal is available on the DEP Website at http://www.dep.state.pa.us (choose Information by Subject/Air Quality/State Implementation Plans), or through the contact person(s) listed below.

The Department will hold a public hearing to receive comments on the SIP revision on Tuesday May 1, 2001 at 1 p.m. at the offices of the DEP Southwest Regional Office, Waterfront Room A, 500 Building, 500 Waterfront Drive, Pittsburgh, PA 15222-4745. The Department's Southwest Regional Office is located at Washington's Landing beneath the 31st Bridge along Pa. Route 28.

Persons wishing to present testimony at the hearing should contact Connie Cross, 717-787-9495 (P.O. Box 8468, Harrisburg, PA 17105) to reserve a time. If you do not reserve a time, you will be able to testify as time allows. Witnesses should keep testimony to 10 minutes and should provide two written copies at the hearing. Persons with a disability who wish to attend the hearing and require an auxiliary aid, service or other accommodation to participate in the proceeding should contact Wick Havens at the telephone above. TDD users may contact the AT&T Relay Service at 800-654-5984 to discuss how the Department can best accommodate their needs.

Written comments should be sent to Wick Havens, Chief Division of Air Resource Management, Bureau of Air Quality, PO Box 8468, Harrisburg, PA 17105-8468 no later than noon on May 2, 2001.

FINAL PITTSBURGH-BEAVER VALLEY AREA OZONE MAINTENANCE PLAN AND REQUEST FOR REDESIGNATION AS ATTAINMENT FOR OZONE

MAY 15, 2001

Pennsylvania Department of
Environmental Protection
Bureau of Air Quality
P.O. Box 2357
Harrisburg, PA 17105-2357

www.dep.state.pa.us

Prepared with support by:

E.H. Pechan & Associates, Inc.
5528-B Hempstead Way
Springfield, VA 22151

CONTENTS

TABLES AND FIGURES

ACRONYMS AND ABBREVIATIONS

AEO	Annual Energy Outlook
AIM	architectural and industrial maintenance
CAA	Clean Air Act
CMSA	consolidated metropolitan statistical area
CO	carbon monoxide
CTG	Control Techniques Guideline
DEP	Department of Environmental Protection
DOT	Department of Transportation
EGAS	Economic Growth Analysis System
EPA	U.S. Environmental Protection Agency
FMVCP	Federal Motor Vehicle Control Program
FTP	Federal Test Procedure
GVWR	gross vehicle weight rating
HAP	hazardous air pollutant
HDDV	heavy-duty diesel vehicle
I/M	inspection and maintenance
LDGTs	light-duty gasoline trucks
LDGT1s	light-duty gasoline trucks 1 (< 6,000 pounds GVWR)
LDGT2s	light-duty gasoline trucks 2 (< 6,000 - 8,500 pounds GVWR)
LDGVs	light-duty gasoline vehicles
LRP	long range plans
MACT	maximum achievable control technology
MSA	metropolitan statistical area
MVMA	Motor Vehicle Manufacturers Association
NAAQS	National Ambient Air Quality Standard
NESHAP	National Emission Standard for Hazardous Air Pollutants
NO_x	oxides of nitrogen
OMS	Office of Mobile Sources
PennDOT	Pennsylvania Department of Transportation
PM_{10}	particulate matter under 10 microns
POTW	publicly-owned treatment works
ppb	parts per billion
ppm	parts per million
PSD	prevention of significant deterioration
psi	pounds per square inch
RACT	reasonably available control technology
REMI	Regional Economic Models, Inc.
RVP	Reid vapor pressure
SIC	Standard Industrial Classification
SIP	State Implementation Plan
TIPs	Transportation Improvement Programs
TSDF	treatment, storage, and disposal facility
VMT	vehicle miles traveled
VOC	volatile organic compound
VRS	vapor recovery systems

EXECUTIVE SUMMARY

This report is a formal request to the U.S. Environmental Protection Agency (EPA) to redesignate the Pittsburgh-Beaver Valley Ozone Nonattainment Area to attainment of the health-based one-hour ozone National Ambient Air Quality Standard (NAAQS). It summarizes the progress of the area in attaining the ozone standard, demonstrates that all Clean Air Act (CAA) requirements for attainment have been adopted and presents a maintenance plan to assure continued attainment over the next ten years.

Analyses included in this document show that measured ambient air quality has attained the NAAQS for ozone and that the emission reductions responsible for the air quality improvement are both permanent and enforceable. This report also includes a maintenance plan that provides for maintenance of the ozone NAAQS for 10 years after redesignation.

The Pittsburgh-Beaver Valley Area was classified by the U.S. Environmental Protection Agency (EPA) as a moderate ozone nonattainment area on November 6, 1991. The primary years used by EPA for the purposes of establishing ozone designations and classifications were 1987 to 1989. For this base year period, the Pittsburgh-Beaver Valley Area ozone design value was 0.149 parts per million (ppm). The comparable design value for the 1998-2000 period is 0.123 ppm. The number of expected exceedances declined from 7.0 days per year during 1987-1989 to 1.0 days per year during 1998-2000.

Figures 1 and 2 show the estimated volatile organic compound (VOC) and oxides of nitrogen (NO_x) emissions by major source category for 1990, 1999, and the end of the maintenance period, 2011. VOC and NO_x are the primary precursors for ozone formation. Emission reductions that occur between 1990 and 1999 are primarily attributable to controls on highway vehicles, electric utility/industrial boilers and industrial VOC sources. Highway vehicle reductions are attributed to a combination of the Federal Motor Vehicle Control Program (FMVCP) (fleet turnover), the automobile test and repair program, stage II controls at service stations and lower gasoline volatility. Continued emission reductions are expected through the maintenance year of 2011 due to the Chapter 145 NOx SIP Call regulations for large boilers and turbines, the highway vehicle control programs including National Low Emission Vehicles (NLEV) and Tier II/low sulfur gasoline rules.

Figure 1: VOC Emissions

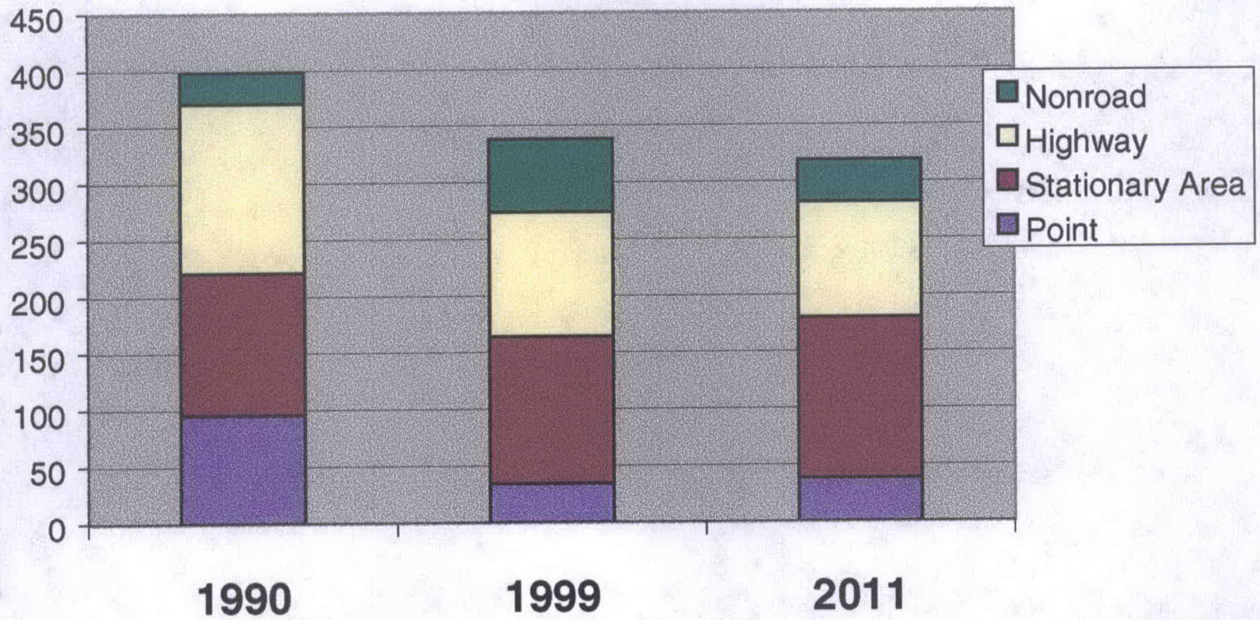
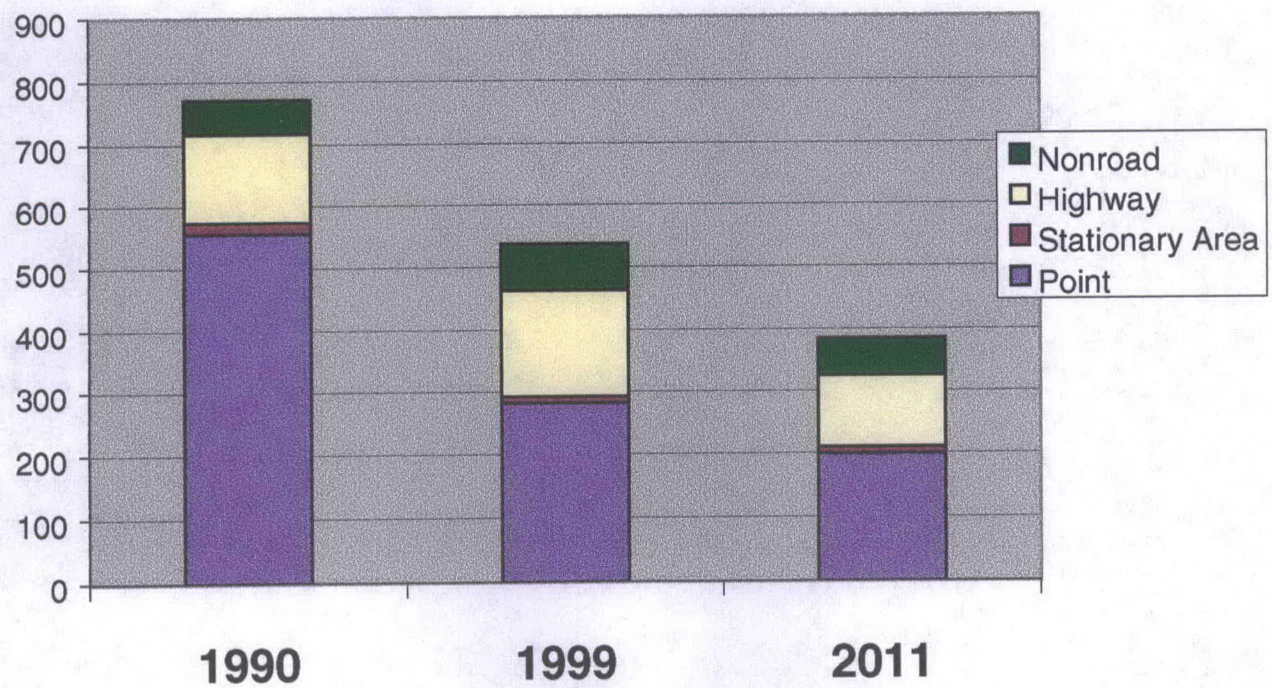


Figure 2: NO_X Emissions



The following are state and federal emission reduction strategies adopted since 1990 that are included in this plan.

Stationary Point Sources

Reasonably Available Control Technology regulations
NOx Memorandum of Understanding rules for utility and industrial boilers
Coke Oven NESHAPS
Prevention of Significant Deterioration review
New Source Review
Section 145 (NOx SIP Call) for utility and industrial boilers

Stationary Area Sources

EPA rules for:

- automobile refinish coatings
- many consumer products
- architectural and industrial maintenance coatings
- wood furniture coatings
- aircraft surface coatings
- marine surface coatings
- metal furniture coatings
- municipal solid waste landfills
- waste treatment, storage and disposal

Additional state regulations on automobile refinishing
Refueling (Stage II) at service stations

Highway Vehicles

Federal Motor Vehicle Control Program including onboard control of evaporative and refueling emissions
Southwestern Pennsylvania gasoline volatility controls
Vehicle emissions inspection/maintenance
National Low Emission Vehicle (NLEV) program
EPA's heavy-duty diesel engine standards (2004 program)
EPA's Tier 2/low sulfur gasoline program for light-duty vehicles

Nonroad Sources

EPA rules for large and small compression-ignition engines
EPA rules for smaller spark-ignition engines
EPA rules for recreational spark-ignition marine engines

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INTRODUCTION

The 1990 Amendments to the Clean Air Act (CAA) authorized EPA to designate ozone nonattainment areas and to classify them according to degree of severity. An area is designated as an ozone nonattainment area if a violation of the NAAQS for ozone has occurred in the past 3 years anywhere in the designated metropolitan statistical area (MSA) or consolidated metropolitan statistical area (CMSA). An ozone nonattainment area can be classified as marginal, moderate, serious, severe, or extreme, depending on the level of violations. Ozone design values are used for classifying areas into attainment and nonattainment categories. The ozone design value is a measure of the maximum ozone concentration expected to occur within an area.

This report constitutes a formal request to EPA to redesignate the Pittsburgh-Beaver Valley Ozone Nonattainment Area to attainment of the ozone NAAQS. The subsequent analyses clearly demonstrate that the ambient air quality in the Pittsburgh-Beaver Valley Nonattainment Area meets the national standards for ozone and the emission reductions responsible for the air quality improvement are both permanent and enforceable. This analysis demonstrates that the Pittsburgh-Beaver Valley Area has completed all criteria set forth in section 107(d)(3)(E) of the CAA and should be officially redesignated as attainment.

Section 107(d)(3)(E) of the CAA, as amended, states that an area can be redesignated to attainment if the following conditions are met:

1. The NAAQS has been attained;

2. The applicable implementation plan has been fully approved under Section 110(k);

3. The improvement in air quality is due to permanent and enforceable reductions in emissions;

4. The State has met all applicable requirements for the area under Section 110 and Part D; and

5. A maintenance plan with contingency measures has been fully approved under Section 175A .

An ambient air quality data analysis was performed that demonstrates that the NAAQS has been achieved within the Pittsburgh-Beaver Valley Area. Fully approved methodologies, as established by EPA, were used to calculate expected exceedances and design values.

Subsequently, a 1990 emissions inventory was compiled for VOC, and NO_x emissions, the primary contributing factors to ozone formation. In addition, 1999 emissions were estimated based on projected economic activity as part of the maintenance plan. This analysis supports the contention that contributing emissions are declining, which will likely lead to further reductions in ambient ozone levels.

Pennsylvania's State Implementation Plan (SIP) should be fully approved by the time the Pittsburgh-Beaver Valley Area is redesignated as attainment. At the present time, approval actions on remaining SIP modifications are currently being completed. However, since approval actions on SIP elements and the redesignation request may occur simultaneously, this should not delay or preclude the approval of this redesignation request. The ozone levels in the Pittsburgh-Beaver Valley Area are currently below the standard and all of the relevant requirements have been met by the Commonwealth of Pennsylvania.

An analysis of existing and potential control measures was also performed to determine the control options necessary for maintaining present ozone levels and implementing contingency measures in the event of any exceedance.

CHAPTER I
AMBIENT AIR QUALITY DATA ANALYSIS

A. INTRODUCTION

The Pittsburgh-Beaver Valley Ozone Nonattainment Area, established by EPA on November 6, 1991 (56 FR 56694, 1991), includes Allegheny, Armstrong, Beaver, Butler, Fayette, Washington and Westmoreland Counties. The analyses in this redesignation request examine the air quality data monitored in these counties and shows that ozone concentrations are now in attainment with the ozone NAAQS.

The Pittsburgh-Beaver Valley Area has been classified as a moderate nonattainment area for ozone. In order to be classified as moderate, an area must have a design value between 0.138 and 0.160 ppm. The primary years used by EPA for the purposes of establishing ozone designations and classifications were 1987 to 1989. Since that time, the air quality in the Pittsburgh-Beaver Valley Area has improved significantly, and is now in compliance with the established ozone NAAQS. This report shows that, based on the most recent 3-year period of analysis, the ozone design value now meets the 0.12 ppm standard and is expected to remain so in the coming years.

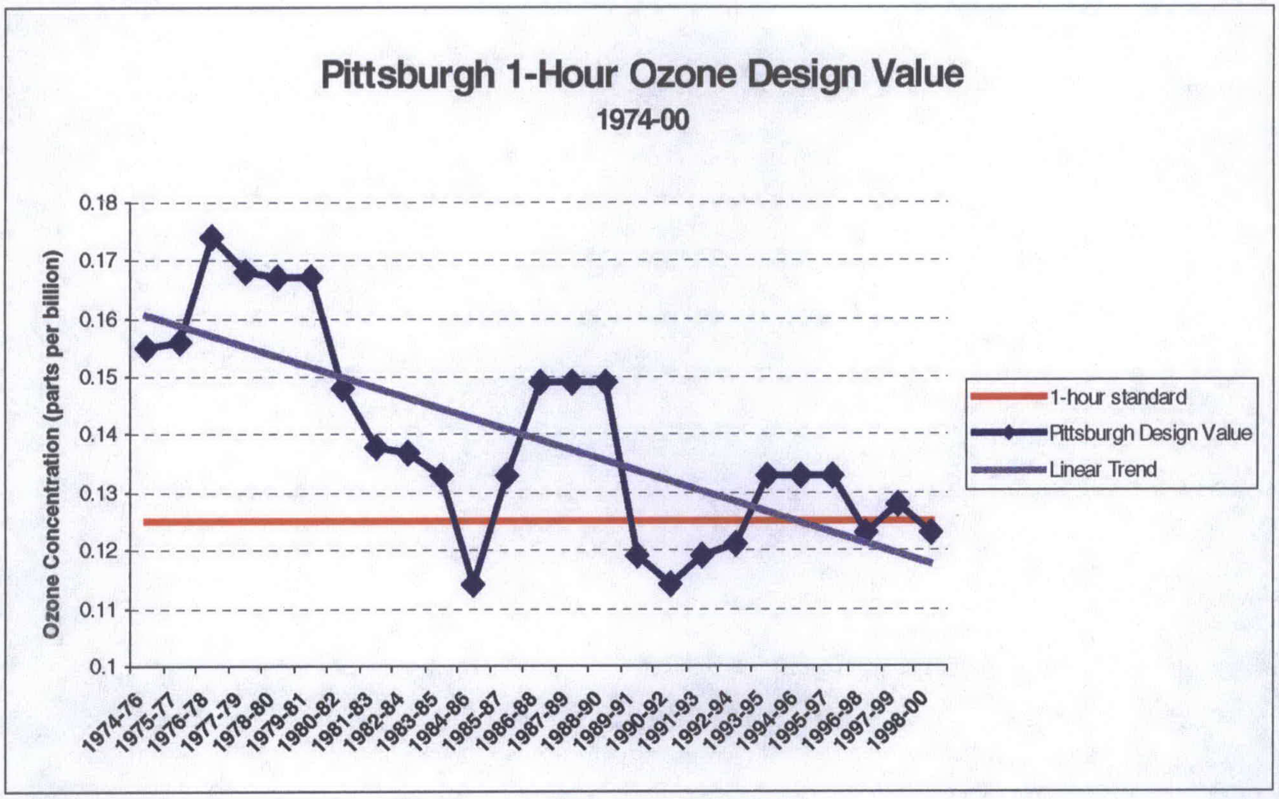
B. DESIGN VALUE DETERMINATION

Ambient ozone data were used to determine the base year and current year ozone design values. The ozone design value during the period from 1987 to 1989 was calculated by EPA to determine the level of nonattainment severity for a given region based on ambient data. The design value is discussed in further detail below. In this analysis, baseline and current year design values were calculated based on data from 1974 to 2000 for each 3-year period. These analyses show that ozone levels declined significantly during this time period.

The ambient air quality analysis is based on ozone data measured at monitoring sites in the Pittsburgh-Beaver Valley Area. There have been a total of 22 ozone monitors operating in the Pittsburgh-Beaver Valley Area during the1974-2000 time period. Of these 22 ozone monitors, only 19 had recording periods long enough to establish a monitor design value (three consecutive years). The number of monitors in the Pittsburgh-Beaver Valley Area has grown from 2 monitors in 1974 to 14 monitors in 2000. Ozone measurements were not taken in Allegheny County (the regions most populated county) until 1978.

Figure I-1 shows the Pittsburgh-Beaver Valley ozone design value during the 1974-2000 time period. A linear trend line is also depicted on this graph. Design values have decreased substantially over the 1974-2000 time period; decreasing from the 0.150-0.170 ppm range in the mid 70s to just below the NAAQS in 2000. Figure I-2 shows the number of monitor exceedances over the same time period. A linear trend line on this graph shows the number of exceedances has dropped by over 50% during the 1974-2000 time period. It is important to remember that design values and monitor exceedances have declined in spite of increased ozone monitor coverage, including ozone monitors in Allegheny County starting in 1978. Ozone design values along with the monitor defining the design value for the Pittsburgh-Beaver Valley Area are listed in Table I-1. Data from these monitoring sites were used to determine the actual and expected number of exceedances and the ozone design value.

Figure I-1



Pittsburgh 1-Hour Ozone Design Value
1974-00
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
Ozone Concentration (parts per billion)
1974-76
1975-77
1976-78
1977-79
1978-80
1979-81
1980-82
1981-83
1982-84
1983-85
1984-86
1985-87
1986-88
1987-89
1988-90
1989-91
1990-92
1991-93
1992-94
1993-95
1994-96
1995-97
1996-98
1997-99
1998-00
1-hour standard
Pittsburgh Design Value
Linear Trend

Figure I-2

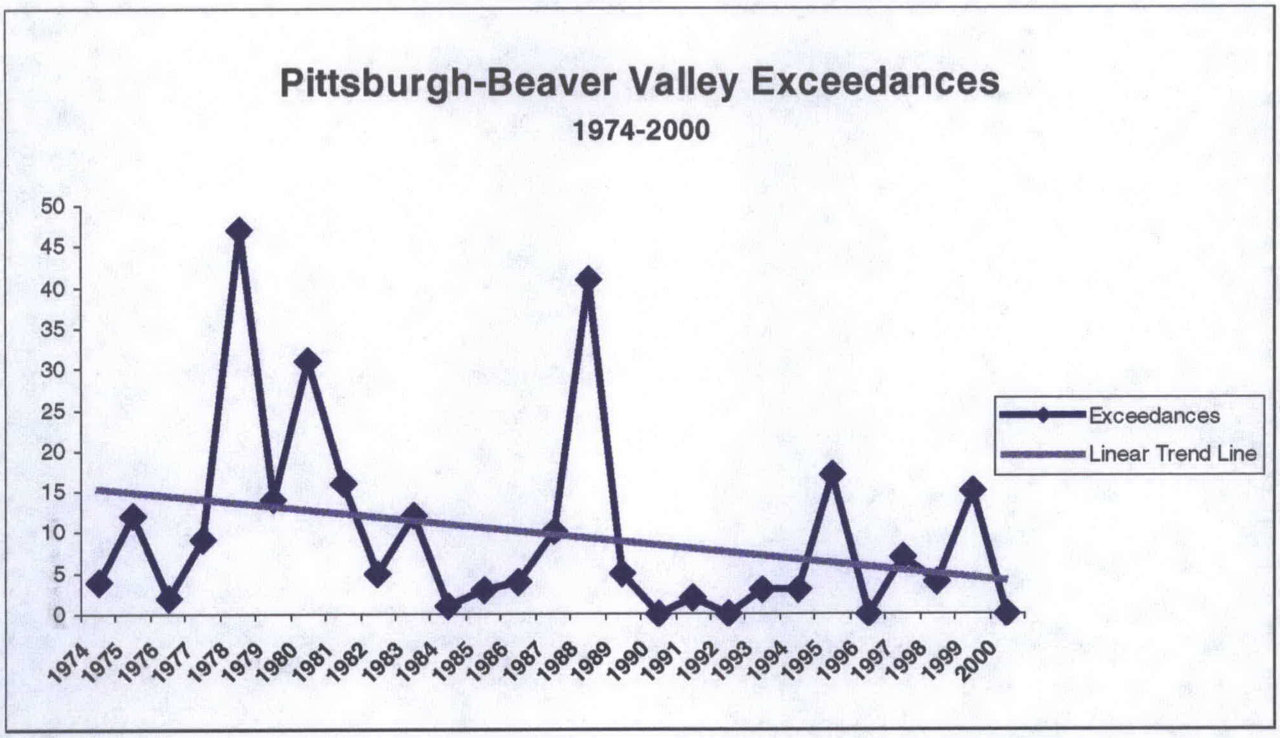

Pittsburgh-Beaver Valley Exceedances
1974-2000
50
45
40
35
30
25
20
15
10
5
0
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Exceedances
Linear Trend Line

Table I-1
Pittsburgh-Beaver Valley Nonattainment Area
Ozone Design Values

Years	Pittsburgh-Beaver Valley DV*	*Design Monitor*	*Number of Monitors*
1974-76	0.155	BADEN	2
1975-77	0.156	BEAVER FALLS	2
1976-78	0.174	BEAVER FALLS	3
1977-79	0.168	BEAVER FALLS	3
1978-80	0.167	LAWRENCEVILLE	5
1979-81	0.167	LAWRENCEVILLE	5
1980-82	0.148	LAWRENCEVILLE	7
1981-83	0.138	BRACKENRIDGE	7
1982-84	0.137	BRACKENRIDGE	7
1983-85	0.133	BRACKENRIDGE	7
1984-86	0.114	MIDLAND	8
1985-87	0.133	BRACKENRIDGE	7
1986-88	0.149	BRACKENRIDGE	7
1987-89	0.149	BRACKENRIDGE	7
1988-90	0.149	BRACKENRIDGE	8
1989-91	0.119	LAWRENCEVILLE	7
1990-92	0.114	LAWRENCEVILLE	9
1991-93	0.119	HARRISON TWP	9
1992-94	0.121	HARRISON TWP	9
1993-95	0.133	HARRISON TWP	8
1994-96	0.133	HARRISON TWP	9
1995-97	0.133	HARRISON TWP	11
1996-98	0.123	CHARLEROI	11
1997-99	0.128	PENN HILLS	12
1998-00	0.123	CHARLEROI	14

* Design values are in parts per million

The ambient air quality data analysis for ozone was completed using the appropriate regulations and guidance documents. Monitoring procedures were determined in accordance with 40 CFR, Part 58 (40 CFR, 1992a). For interpretation and calculation of the expected number of exceedances and the design value, appropriate regulations and corresponding guidance documents were used (EPA, 1979; 40 CFR, 1992b).

As the ozone-monitoring season extends from April 1 through October 31, data were analyzed for this period. Data for the Pittsburgh-Beaver Valley monitoring sites were retrieved from EPA's AIRS air monitoring data system. In determining the validity of an ozone value, the following conditions apply:

1. If the value is greater than the standard, it is valid, regardless of the number of hourly values available for that day.

2. If the value is less than the standard, validity was determined using the criteria below:

- If data were available for 75 percent of the hours between 9 a.m. and 9 p.m. (i.e., 9 hours), then the daily maximum is valid.

- If data were available for less than 75 percent of the hours between 9 a.m. and 9 p.m., the daily maximum is considered missing or invalid.

- For purposes of calculating the expected number of days exceeding the standard, the days with missing or invalid data are further evaluated to determine if they can be assumed to have a daily maximum less than the standard. This is done by looking at the daily maxima from the day before and the day after. If these maxima are valid and less than 75 percent of the standard (i.e., 0.09 ppm), then the daily maximum for the day in question can be assumed to be less than the standard. This methodology does not allow 2 or more consecutive days of missing or invalid data to be assumed to be less than the standard.

The data required to evaluate the ozone levels for the Pittsburgh-Beaver Valley Area are: (1) the number of days exceeding the standard; (2) the expected number of days exceeding the standard; and (3) the ozone design value. The daily maximum ozone limit is 124 parts per billion (ppb), concentrations above which would be considered an exceedance. The number of days exceeding the standard must be less than or equal to 1 per year averaged over a 3-year period for an area to be in attainment with the ozone NAAQS. The expected number of days exceeding the standard takes into account days with incomplete or missing data.

To determine the overall number of days exceeding the standard, the ambient daily ozone levels were examined for each site during the ozone season for the Pittsburgh-Beaver Valley Area (April 1 through October 31). The four highest maximum hourly ozone values for each year were retrieved. Based on the valid data retrieved from the monitoring system, the number of maximum values greater than the standard is used as the number of exceedances.

Subsequent to determining the actual number of exceedances, the **expected** number of exceedances was calculated, taking into account days with missing or invalid data, days with a maximum assumed to be less than the standard, and the total number of days in the ozone monitoring period (i.e., 214 days).

This calculation was performed using the following formula:

$$e=v+[(v/n)*(N-n-z)]$$

where:

- e = expected number of exceedances
- v = number of days with maxima exceeding the standard
- n = number days with valid maxima
- N = number of days within the ozone monitoring season (4/1 to 10/31 = 214 days)
- z = number of days with a maximum assumed to be less than the standard.

Monitoring sites may have years that are not valid. In order for a year of data at a particular site to be complete or valid, at least 75 percent of the days within the ozone season must have a valid daily maximum. Determining the number of years of complete monitoring is important in determining the expected number of exceedances and the design value for each site. For example, if there is one year within the 3-year period of analysis that is not valid for a specific monitoring site, the expected number of exceedances for the valid years will be calculated by dividing the expected exceedance values by 2 instead of 3, which could significantly increase the overall expected number of exceedances for the period of analysis (EPA, 1979). All monitoring data for the years included in this analysis were complete.

The expected number of exceedances was determined for each year between 1974 and 2000. These annual values were averaged over each of the 3-year periods within this timeframe to obtain an overall value for purposes of determining attainment under the CAA. As Table I-2 shows, the number of exceedances and the expected number of exceedances for the Pittsburgh-Beaver Valley Area were 15 and 19.6 days respectfully in the first 3-year period. These overall values were obtained by averaging the annual values over the 1974 to 1976 time period.

The level of the fourth highest daily maximum over a 3-year period of analysis is considered the "ozone design value," which is used to determine the ozone nonattainment classification. In order to determine the design value, the four highest daily maxima are selected for each year by monitoring site. The values for each site over the 3-year period are ranked from 1 to 12 (i.e., highest to lowest, respectively). By definition, the design value is the daily maximum with the rank equal to the number of years of complete monitoring plus 1. Since all years are valid for the monitoring site, the design value for each 3-year period is the fourth highest valid daily maximum.

Table I-2
Pittsburgh-Beaver Valley Nonattainment Area
Ozone Monitoring Data Summary

Year	*Design Monitor*	Monitored Exceedances	Expected Exceedances	Average Expected Exceedances per year	Design Value
1974-76	BADEN	15	19.6	6.5	0.155
1975-77	BEAVER FALLS	7	17.2	5.7	0.156
1976-78	BEAVER FALLS	26	39.7	13.2	0.174
1977-79	BEAVER FALLS	25	35.1	11.7	0.168
1978-80	LAWRENCEVILLE	22	27.5	9.2	0.167
1979-81	LAWRENCEVILLE	14	18.2	6.1	0.167
1980-82	LAWRENCEVILLE	8	10.3	3.4	0.148
1981-83	BRACKENRIDGE	11	13.2	4.4	0.138
1982-84	BRACKENRIDGE	8	8.7	2.9	0.137
1983-85	BRACKENRIDGE	7	7.3	2.4	0.133
1984-86	MIDLAND	2	2.5	0.8	0.114
1985-87	BRACKENRIDGE	5	5.1	1.7	0.133
1986-88	BRACKENRIDGE	18	19.9	6.6	0.149
1987-89	BRACKENRIDGE	19	20.9	7.0	0.149
1988-90	BRACKENRIDGE	15	16.8	5.6	0.149
1989-91	LAWRENCEVILLE	2	2	0.7	0.119
1990-92	LAWRENCEVILLE	1	1	0.3	0.114
1991-93	HARRISON TWP	2	2.1	0.7	0.119
1992-94	HARRISON TWP	2	2	0.7	0.121
1993-95	HARRISON TWP	9	9	3.0	0.133
1994-96	HARRISON TWP	8	8	2.7	0.133
1995-97	HARRISON TWP	10	10	3.3	0.133
1996-98	CHARLEROI	3	3	1.0	0.123
1997-99	PENN HILLS	4	4	1.3	0.128
1998-00	CHARLEROI	3	3	1.0	0.123

The average number of actual and expected exceedances, and the design values are presented in Table I-2 for each 3-year period from 1974 to 2000. For the base year determination (1987-89), the design value is 0.149 ppm. Since this value is above the NAAQS, the Pittsburgh-Beaver Valley Area was classified as a moderate ozone nonattainment area. Design values and ozone exceedances have declined since Pennsylvania first collected data in 1974. As noted in Table I-2 and Figure I-1 design values in the Pittsburgh-Beaver Valley Area are now currently below the NAAQS. The average number of expected exceedances has dropped from 7.0 for the 1987-1989 original designation 3-year period to 1.0 for the most recent period.

C. AMBIENT MONITORING ISSUES

1. Monitoring Sites

Twenty-two (22) ozone monitors have operated in the Pittsburgh-Beaver Valley Area during the 1974-2000 time period. Of these 22 monitors, only 19 had sufficient data (three consecutive years) to calculate ozone design values. Currently, there are 14 monitors operating in the Pittsburgh-Beaver Valley Area. In 1974 there were 2 ozone monitors operating in the Pittsburgh-Beaver Valley Area, and none in Allegheny County (the area's most populated county).

2. Climatic Trends

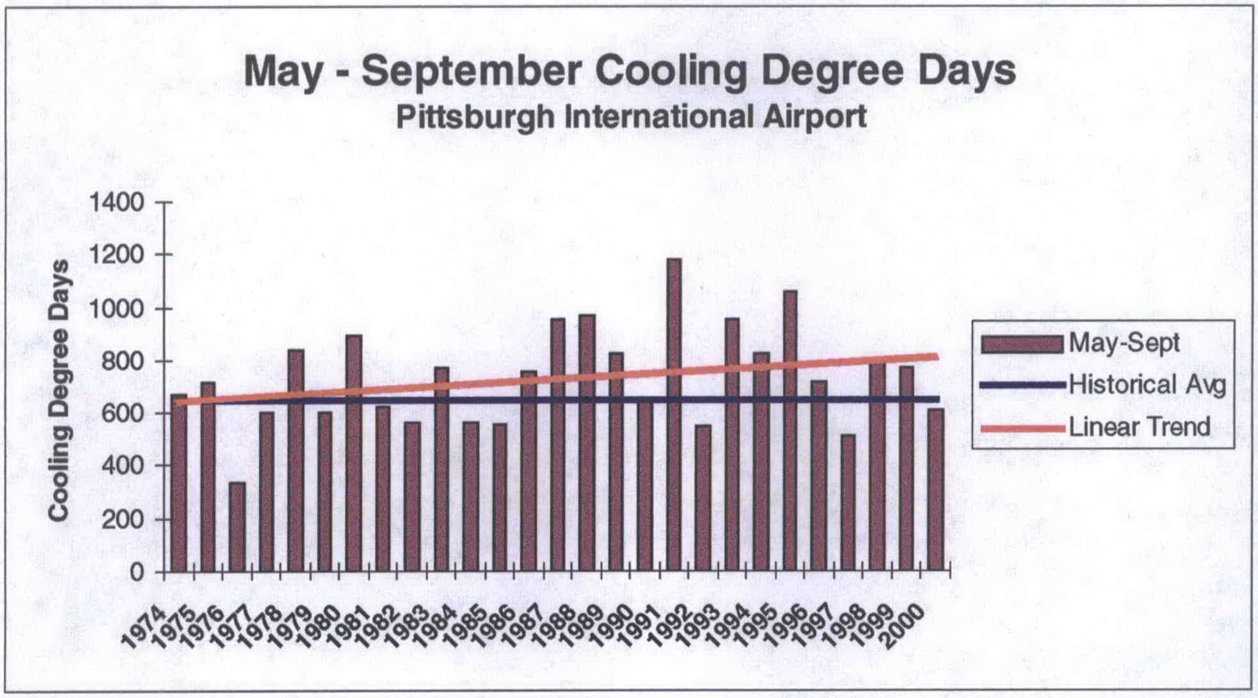
Climate can impact ozone concentrations in a particular area. Since ground-level ozone is a product of photochemical reactions, increases in sunlight intensity and temperatures can intensify ozone formation. To gauge the possible effects of climate on the Pittsburgh-Beaver Valley Area ozone exceedances and design values, climate trends at the Pittsburgh International Airport were examined. Several meteorological variables were examined to determine climate trends over the 1974-2000 time period. These included cooling degree-days, average monthly temperatures, 90° days (days in which max temperatures were ≥90°F), and precipitation. Climate data for the months of May through September were examined to coincide with the summer months when ozone concentrations are the highest.

Climate trend results for the Pittsburgh International Airport site indicate conditions conductive to producing high ozone concentrations (warm temperatures and clear skies) were more common in recent years than in the 1970's and 80's. All of the climate variables we reviewed, with the exception of precipitation, showed a general upward trend over time. This indicated conditions favorable for ozone formation were more likely to occur recently than in the past. Ozone trends in Pittsburgh-Beaver Valley Area, however, show exceedances and ozone design values decreasing over the same time period. This decline occurred even as the ozone-monitoring network became more enhanced. In short, ozone exceedances and design values have decreased in the Pittsburgh-Beaver Valley Area even though regional climatology has favored enhanced ozone production over the last decade. It is therefore likely that local emission control programs in the Pittsburgh-Beaver Valley Area are responsible for the decline in ozone exceedances and design values during the 1974-2000 time period.

a. Cooling Degree Days

Figure I-3 presents the number of cooling degree-days during the study period (1974-2000) along with a linear trend line and long-term average for the Pittsburgh International Airport. The figure shows cooling degree-days have generally increased over the study period. Cooling degree days gauge how warm a particular time period is, the higher the cooling degree number the warmer the time period. The recent increase in the cooling degree-days in the Pittsburgh-Beaver Valley Area contrasts with declining ozone exceedances and design values occurring over the same time period.

Figure I-3

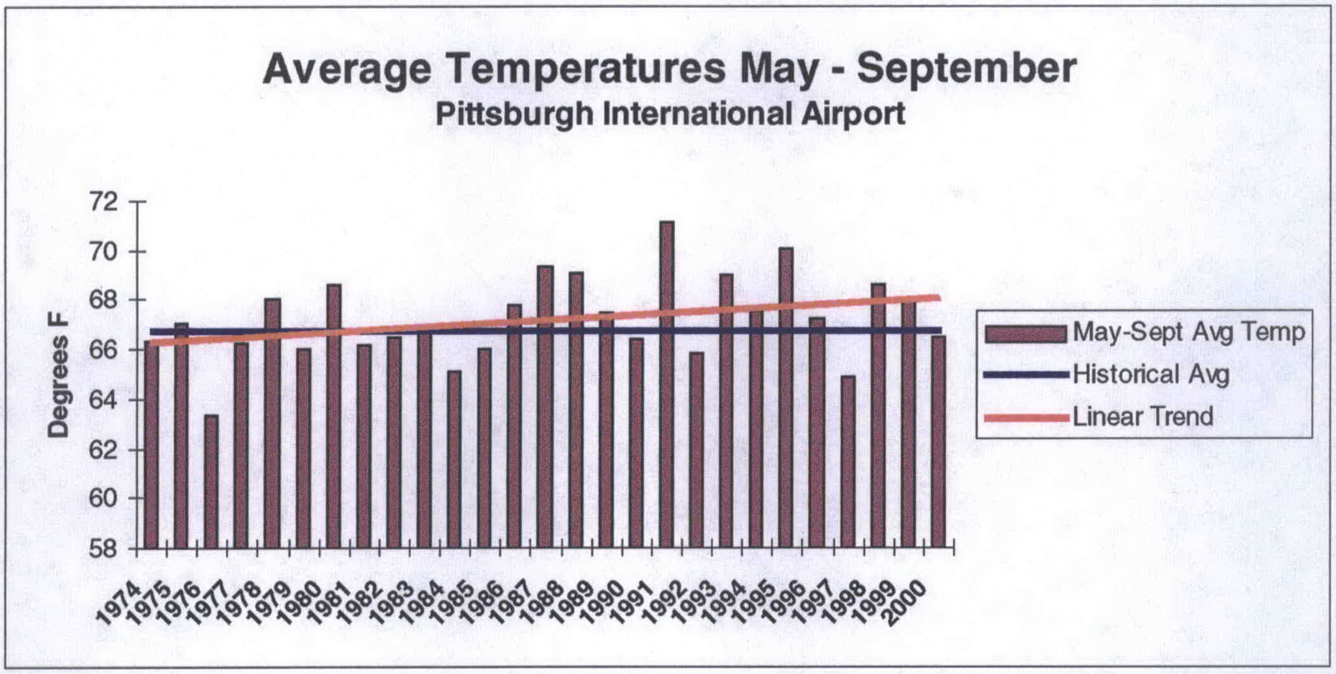


May - September Cooling Degree Days
Pittsburgh International Airport
Cooling Degree Days
1400
1200
1000
800
600
400
200
0
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
May-Sept
Historical Avg
Linear Trend

b. Mean Temperature

Figure I-4 presents the average ozone season (May through September) temperatures at Pittsburgh International Airport from 1974 to 2000. Also included in this graph is the long-term average along with a linear trend line. Average temperatures for the 1974-2000 time period appear to be below the long-term average, though the temperature trend appears to be increasing. This temperature trend is consistent with the cooling degree trend. Both trends contrast with downward trends in ozone exceedances and design values in the Pittsburgh-Beaver Valley Area.

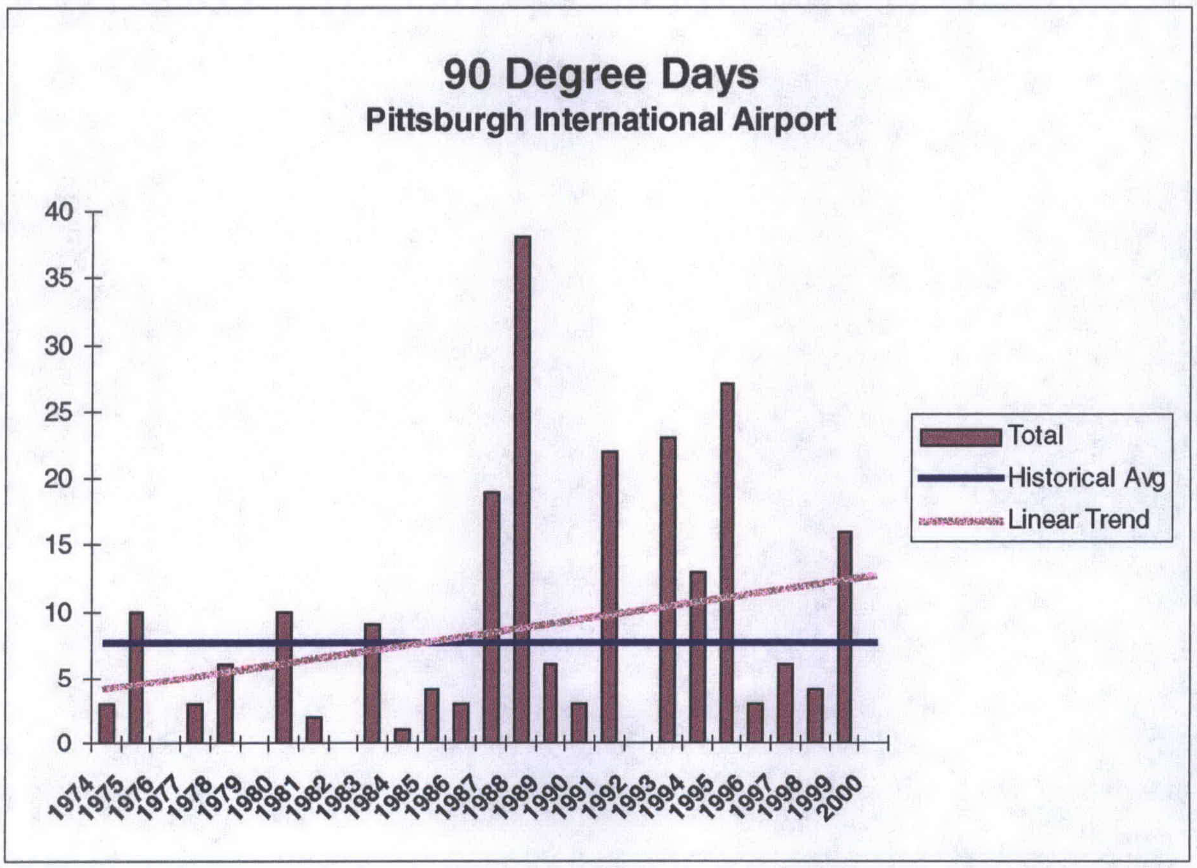
Figure I-4



c. 90 Degree Days

Figure I-5 shows the number of 90° days (days in which max temperatures are ≥90° F) at Pittsburgh International Airport during the study period. The number of 90°days is another measure of how warm a particular summer is. Also included in the graph are a linear trend line and the long-term average for the Pittsburgh International Airport. The data indicate a general increase in the number of 90°days over the study period. This upward trend is similar to trends observed in the cooling degree day and average temperature data, and opposite the trends observed in the ozone exceedance and design value data for the Pittsburgh-Beaver Valley Area.

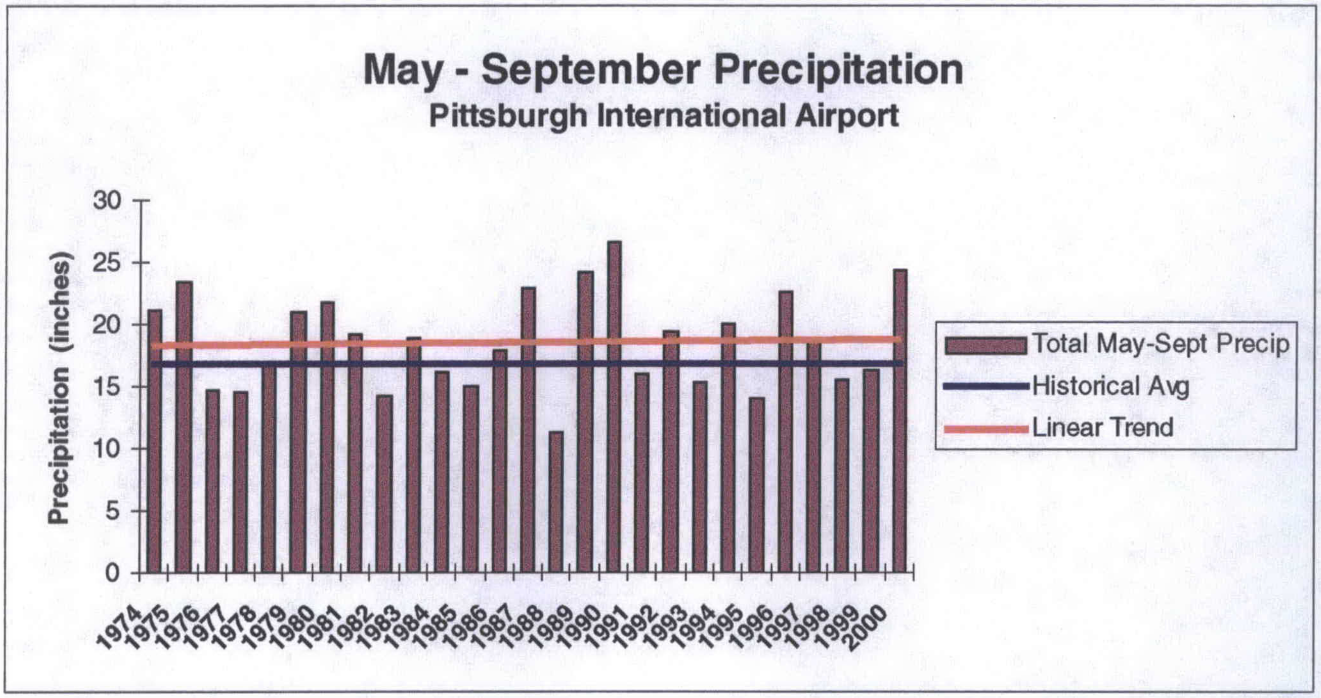
Figure I-5



d. Precipitation

Figure I-6 shows ozone season (May-September) precipitation at Pittsburgh International Airport during the study period. A linear trend line along with a long-term average is also shown on the graph. Summers with below average precipitation are more prone to having days with enhanced ozone production (less cloudy days). Dry summers also tend to be warmer than average, further increasing the likelihood of enhanced ozone production. Precipitation trends appear to be relatively unchanged during the study period.

Figure I-6



e. Climate Indexing

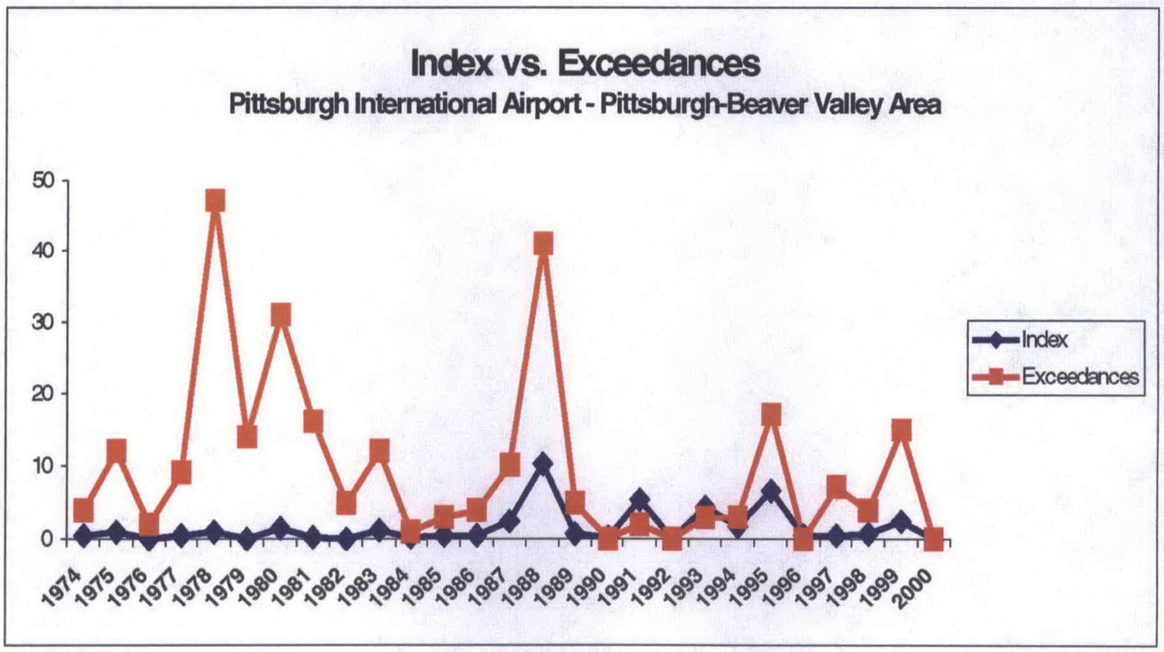
A number of climate variables have been reviewed in this chapter including cooling degree days, average temperatures, 90° days, and precipitation. All of these variable have some influence on ozone concentrations over the ozone season. Indexing attempts to encompass all of the information reviewed into one number so that different years can be compared with one another in a simplified way. The index developed in this study encompasses all of the climate variable reviewed previously and compares them with seasonal averages. The index is defined as follows:

$$I = \frac{[(90°\text{days}+1)_i \,(\text{Avg Temperature})_i\, (\text{Cooling Degree Days})_i / (\text{Precipitation})_i}{[(90°\text{days}+1)_{avg} \,(\text{Avg Temperature})_{avg}\, (\text{Cooling Degree Days})_{avg} / (\text{Precipitation})_{avg}}$$

where $(....)_i$ = year i value,
$(....)_{avg}$ = long-term average and
I = index

Figure I-7 shows index values for the Pittsburgh International Airport along with ozone exceedances in the Pittsburgh-Beaver Valley Area over the 1974-2000 time period. Index numbers appear to confirm conditions favorable for ozone formation occurred quite frequently in the last decade. Exceedances appear to be following fluctuations in the index during this time period. Prior to the mid 80s the index shows no year that is comparable to what was observed in the late 80s or 90s, though there are large peaks in monitor exceedances. This suggests that during the 70s and early 80s exceedances were caused by large anthropogenic emissions and as emissions have been reduced exceedances have aligned more with climatic forcing.

Figure I-7



CHAPTER II
EMISSIONS INVENTORY

This chapter provides an assessment of the ozone precursor emissions at the time the Pittsburgh-Beaver Valley Area was originally designated as nonattainment for ozone, and at the time when this Area measured attainment of the ozone one-hour average NAAQS. A 1990 inventory of VOC and NO_x emissions is used to represent emissions during the ozone nonattainment designation period (the base year). An estimate of 1999 VOC and NO_x emissions for the Pittsburgh-Beaver Valley Area is used for ozone precursor emissions during the period when the Pittsburgh-Beaver Valley Area demonstrated that it attained the 1-hour ozone NAAQS. This chapter describes these 1990 and 1999 ozone precursor emissions. Then, it presents information about the permanent and enforceable control measures that have been implemented in Pittsburgh-Beaver Valley Area to produce the VOC and NO_x emission reductions that have occurred between 1990 and 1999.

In 1996, the Commonwealth convened the Southwest Pennsylvania Ozone Stakeholder Working Group to develop a course of action for the attainment and maintenance of the one-hour ozone standard, tailored to meet the regional needs of the area. The group presented its recommendations in January 1997. The immediate recommendations of the group including NOx reductions from large boilers, an improved vehicle emission inspection/maintenance program, Stage II vapor recovery systems for gasoline stations and cleaner gasoline have been adopted and included in the emissions inventory for 1999 as appropriate. The Commonwealth has implemented these and other ozone reduction strategies as presented in this plan.

A. BASE YEAR (1990) EMISSION ESTIMATES

A base year emissions inventory for 1990 was developed in accordance with EPA guidance. Table II-1 shows the combined listing of stationary point and area source (stationary area, nonroad and highway) emissions for 1990 by source category. These 1990 emission estimates for the Pittsburgh-Beaver Valley Area are the same as those provided earlier to EPA by the Pennsylvania DEP as the revised SIP emission inventory for 1990 which was submitted on March 22, 1996 and supplemented on February 18, 1997.

TABLE II-1: Summary of 1990 Emissions (ozone season tons/day)

Tier 2 Category	Point Source VOC	Point Source NO_x	Area Source VOC	Area Source NO_x	Total VOC	Total NO_x
Fuel Comb. Elec. Utility						
Coal	1.52	444.26	0.00	0.00	1.52	444.26
Oil	0.00	0.19	0.00	0.00	0.00	0.19
Gas	0.00	0.06	0.00	0.00	0.00	0.06
Internal Combustion	0.44	18.02	0.00	0.00	0.44	18.02
Fuel Comb. Industrial						
Coal	0.09	27.16	0.00	0.00	0.09	27.16
Oil	0.00	0.43	0.00	0.00	0.00	0.43
Gas	0.41	20.99	0.00	0.00	0.41	20.99
Other	0.00	0.45	0.00	0.00	0.00	0.45
Internal Combustion	0.01	0.03	0.00	0.00	0.01	0.03
Fuel Comb. Other						
Commercial/Institutional Coal	0.00	0.76	0.00	0.00	0.00	0.76
Commercial/Institutional Oil*	0.00	0.01	0.07	2.06	0.07	2.07
Commercial/Institutional Gas*	0.00	0.86	0.59	11.27	0.59	12.13
Other Non-Residential	0.00	0.54	0.00	0.00	0.00	0.54
Residential Coal	0.00	0.00	0.01	2.16	0.01	2.16
Chemical & Allied Product Mfg						
Organic Chemicals	0.54	0.15	0.00	0.00	0.54	0.15
Polymers & Resins	6.40	0.12	0.00	0.00	6.40	0.12
Agricultural Chemicals	0.48	2.54	0.00	0.00	0.48	2.54
Paints, Varnishes, Lacquers, Enamels	2.02	0.00	0.00	0.00	2.02	0.00
Other Chemicals	0.63	0.00	0.00	0.00	0.63	0.00
Metals Processing						
Non-Ferrous Metals Processing	0.05	0.43	0.00	0.00	0.05	0.43
Ferrous Metals Processing	63.60	21.30	0.00	0.00	63.60	21.30
Not Elsewhere Classified	1.05	0.26	0.00	0.00	1.05	0.26
Petroleum & Related Industries						
Petroleum Refineries & Related Industries	0.07	0.00	0.00	0.00	0.07	0.00
Asphalt Manufacturing	0.49	0.77	0.00	0.00	0.49	0.77
Other Industrial Processes						
Agriculture, Food, & Kindred Products	0.15	0.00	1.31	0.00	1.46	0.00
Rubber & Miscellaneous Plastic Products	0.15	0.00	0.00	0.00	0.15	0.00
Mineral Products	1.27	14.29	0.00	0.00	1.27	14.29
Fabricated Metals	0.01	0.80	0.00	0.00	0.01	0.80
Miscellaneous Industrial Processes	0.10	0.04	0.00	0.00	0.10	0.04
Solvent Utilization						
Degreasing	0.58	0.00	11.60	0.00	12.18	0.00
Graphic Arts	0.95	0.00	1.67	0.00	2.62	0.00
Dry Cleaning	0.00	0.00	0.51	0.00	0.51	0.00
Surface Coating	6.82	0.18	42.78	0.00	49.60	0.18

	Point Source		Area Source		Total	
Tier 2 Category	**VOC**	**NO_x**	**VOC**	**NO_x**	**VOC**	**NO_x**
Other Industrial	0.46	0.00	0.00	0.00	0.46	0.00
Nonindustrial	0.00	0.00	24.84	0.00	24.84	0.00
Storage & Transport						
Bulk Terminals & Plants	1.29	0.00	0.00	0.00	1.29	0.00
Petroleum & Petroleum Product Storage	1.70	0.00	0.04	0.00	1.74	0.00
Petroleum & Petroleum Product Transport	0.50	0.00	0.16	0.00	0.66	0.00
Service Stations: Stage I	0.07	0.00	4.30	0.00	4.37	0.00
Service Stations: Vehicle Refueling	0.00	0.00	16.80	0.00	16.80	0.00
Service Stations: Breathing Losses	0.00	0.00	1.44	0.00	1.44	0.00
Organic Chemical Storage	2.97	0.00	0.00	0.00	2.97	0.00
Organic Chemical Transport	0.38	0.00	0.00	0.00	0.38	0.00
Bulk Materials Storage	0.02	0.10	0.00	0.00	0.02	0.10
Waste Disposal & Recycling						
Incineration	0.18	0.29	0.93	0.93	1.11	1.22
Open Burning	0.00	0.00	1.02	1.19	1.02	1.19
POTW	0.30	0.00	3.22	0.00	3.52	0.00
TSDF	0.00	0.00	12.48	0.00	12.48	0.00
Landfills	0.01	0.05	0.07	0.00	0.08	0.05
Highway Vehicles						
Light-Duty Gas Vehicles & Motorcycles	0.00	0.00	130.79	108.78	130.79	108.78
Light-Duty Gas Trucks	0.00	0.00	14.40	13.55	14.40	13.55
Heavy-Duty Gas Vehicles	0.00	0.00	2.28	2.27	2.28	2.27
Diesels	0.00	0.00	2.53	19.89	2.53	19.89
Off-Highway						
Non-Road Gasoline	0.00	0.00	19.66	25.06	19.66	25.06
Aircraft	0.00	0.00	5.97	2.08	5.97	2.08
Railroads	0.00	0.00	2.03	26.93	2.03	26.93
Miscellaneous						
Other Combustion	0.00	0.00	1.54	0.20	1.54	0.20
Health Services	0.06	0.00	0.00	0.00	0.06	0.00
Totals	**95.77**	**555.08**	**303.04**	**216.37**	**398.81**	**771.45**

NOTE: *Area source fuel combustion was not inventoried by sector and was therefore summarized under the Commercial/Institutional category.

B. 1999 EMISSION ESTIMATES

Ozone season daily VOC and NO_x emission estimates for the Pittsburgh-Beaver Valley Area are summarized in Table II-2. Some emission estimation methods for 1999 differed by sector from those used for the 1990 baseline inventory.

Pittsburgh-Beaver Valley Area highway vehicle emissions in 1999 were estimated using MOBILE5b and Pennsylvania Department of Transportation (PennDOT) estimates of vehicle miles traveled (VMT) by vehicle type and roadway type including updated planning assumptions and an improved methodology to allocate truck emissions. More information on highway vehicle methods is contained in Appendix A. Estimates of nonroad engine/vehicle emissions for source categories covered by the EPA NONROAD model were estimated using this NONROAD model which differs significantly from older emission factors/techniques used in the 1990 baseline. Estimates of 1999 VOC and NO_x emissions from all other area source categories were performed by projecting Pennsylvania's 1996 Periodic Emission Inventory estimates of area source emissions to 1999 using growth and control factors by source category. These improved and more accurate inventory techniques estimate higher emissions from previous techniques. For the purposes of this analysis the 1990 baseline has not been revised to reflect those higher emission estimates. Therefore, emission reductions from the 1990 baseline are conservatively underestimated but still show significant improvement.

For the majority of the nonroad mobile source categories, 1999 base year emission estimates were developed using EPA Office of Transportation and Air Quality's June 2000 NONROAD model (EPA, 2000). The NONROAD model estimates emissions for diesel, gasoline, liquefied petroleum gasoline, and compressed natural gas-fueled nonroad equipment types. The model was run for the Pittsburgh-Beaver Valley Area for inventory year 1999, specifying typical summer weekday emissions as the output. The RVP and temperature values replaced the model default values and are specific for Pittsburgh-Beaver Valley Area. The fuel sulfur content and percent oxygen used are default values. The temperature and fuel characteristic input values used for the Pittsburgh-Beaver Valley Area are summarized in Table II-3. In addition, for the recreational marine category, State-level NONROAD model default equipment populations for Pennsylvania were replaced with 1999 boat populations obtained from Pennsylvania's Fish and Boat Commission. Since the NONROAD model estimates county-level boat populations by allocating State populations to counties based on water surface area, county-level recreational marine equipment populations for the Pittsburgh-Beaver Valley Area are different from the model default values. Equipment populations for recreational marine SCCs are provided in Table II-4.

The 1999 point source emissions are estimated from 1996 point source emission estimates, as well, because the 1999 point source data base for the Pittsburgh-Beaver Valley Area is not yet completed. Point source 1999 emissions are estimated by first applying Bureau of Economic Analysis (BEA) growth factors by Source Classification Code (SCC) for fuel combustion SCCs and Department of Energy Annual Energy Outlook 1998 growth factors by Standard Industrial Classification (SIC) code for non-fuel combustion SCCs. The effects of controls that have been installed since 1996 on point sources in the area are accounted for by using the 1999 NO_x allowances established by Phase 2 of the Ozone Transport Commission Memorandum of Understanding.

Table II-2: Summary of 1999 Emissions (ozone season tons/day)

Source Category	Point Source VOC	Point Source NO_x	Area Source VOC	Area Source NO_x	Total VOC	Total NO_x
Fuel Comb. Elec. Utility						
Coal	1.17	168.95	0.00	0.00	1.17	168.95
Oil	5.11	2.02	0.00	0.00	5.11	2.02
Gas	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Internal Combustion	0.09	6.64	0.00	0.00	0.09	6.64
Fuel Comb. Industrial						
Coal	0.06	5.89	0.00	0.00	0.06	5.89
Oil	0.02	1.12	0.00	0.00	0.02	1.12
Gas	1.62	19.35	0.00	0.00	1.62	19.35
Other	0.01	0.00	0.00	0.00	0.01	0.00
Internal Combustion	0.76	16.73	0.00	0.00	0.76	16.73
Fuel Comb. Other						
Commercial/Institutional Coal	0.09	1.14	0.00	0.00	0.09	1.14
Commercial/Institutional Oil	0.03	0.58	0.00	1.01	0.03	1.59
Commercial/Institutional Gas	0.96	8.85	0.00	2.00	0.96	10.85
Misc. Fuel Comb. (Except Residential)	0.05	0.03	0.00	0.00	0.05	0.03
Residential Other	0.00	0.00	0.18	4.43	0.18	4.43
Chemical & Allied Product Mfg						
Organic Chemicals	0.14	0.00	0.00	0.00	0.14	0.00
Inorganic Chemicals	0.00	0.00	0.00	0.00	0.00	0.00
Polymers & Resins	4.38	0.02	0.00	0.00	4.38	0.02
Agricultural Chemicals	0.00	1.00	0.00	0.00	0.00	1.00
Paints, Varnishes, Lacquers, Enamels	1.39	0.01	0.00	0.00	1.39	0.01
Pharmaceuticals	0.00	0.00	0.00	0.00	0.00	0.00
Other Chemicals	1.41	0.00	0.00	0.00	1.41	0.00
Metals Processing						
Non-Ferrous Metals Processing	0.27	0.68	0.00	0.00	0.27	0.68
Ferrous Metals Processing	6.20	35.16	0.00	0.00	6.20	35.16
Metals Processing NEC	0.35	0.07	0.00	0.00	0.35	0.07
Petroleum & Related Industries						
Oil & Gas Production	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refineries & Related Industries	0.01	0.00	0.00	0.00	0.01	0.00
Asphalt Manufacturing	0.00	0.02	0.00	0.00	0.00	0.02
Other Industrial Processes						
Agriculture, Food, & Kindred Products	0.26	0.00	1.02	0.00	1.28	0.00
Textiles, Leather, & Apparel Products	0.00	0.00	0.00	0.00	0.00	0.00
Wood, Pulp & Paper, & Publishing Products	0.00	0.00	0.00	0.00	0.00	0.00
Rubber & Miscellaneous Plastic Products	0.09	0.00	0.00	0.00	0.09	0.00
Mineral Products	0.37	13.30	0.00	0.00	0.37	13.30
Machinery Products	0.06	0.01	0.00	0.00	0.06	0.01

Source Category	Point Source VOC	Point Source NO_x	Area Source VOC	Area Source NO_x	Total VOC	Total NO_x
Electronic Equipment	0.04	0.00	0.00	0.00	0.04	0.00
Miscellaneous Industrial Processes	0.20	0.04	0.00	0.00	0.20	0.04
Solvent Utilization						
Degreasing	1.28	0.00	20.32	0.00	21.60	0.00
Graphic Arts	0.14	0.01	6.67	0.00	6.81	0.01
Dry Cleaning	0.25	0.00	0.51	0.00	0.76	0.00
Surface Coating	2.59	0.02	47.84	0.00	50.43	0.02
Other Industrial	1.20	0.00	0.00	0.00	1.20	0.00
Nonindustrial	0.00	0.00	29.41	0.00	29.41	0.00
Storage & Transport						
Bulk Terminals & Plants	0.69	0.00	0.00	0.00	0.69	0.00
Petroleum & Petroleum Product Storage	1.37	0.00	0.00	0.00	1.37	0.00
Petroleum & Petroleum Product Transport	0.44	0.01	0.16	0.00	0.60	0.01
Service Stations: Stage I	0.00	0.00	0.43	0.00	0.43	0.00
Service Stations: Stage II	0.00	0.00	6.63	0.00	6.63	0.00
Service Stations: Breathing & Emptying	0.00	0.00	1.47	0.00	1.47	0.00
Organic Chemical Storage	0.71	0.00	0.00	0.00	0.71	0.00
Organic Chemical Transport	0.07	0.00	0.00	0.00	0.07	0.00
Inorganic Chemical Storage	0.00	0.00	0.00	0.00	0.00	0.00
Bulk Materials Storage	0.01	0.21	0.00	0.00	0.01	0.21
Waste Disposal & Recycling						
Incineration	0.00	0.00	3.29	1.24	3.29	1.24
Open Burning	0.00	0.00	5.30	1.06	5.30	1.06
POTW	0.06	0.00	5.21	0.00	5.27	0.00
Industrial Waste Water	0.13	0.00	0.00	0.00	0.13	0.00
TSDF	0.00	0.00	0.25	0.00	0.25	0.00
Landfills	0.18	0.25	1.04	0.00	1.22	0.25
Other	0.00	0.00	0.00	0.00	0.00	0.00
Highway Vehicles						
Light-Duty Gas Vehicles & Motorcycles	0.00	0.00	61.43	66.89	61.43	66.89
Light-Duty Gas Trucks	0.00	0.00	36.54	40.05	36.54	40.05
Heavy-Duty Gas Vehicles	0.00	0.00	6.14	10.87	6.14	10.87
Diesels	0.00	0.00	5.54	53.24	5.54	53.24
Off-Highway						
Non-Road Gasoline	0.00	0.00	54.44	4.49	54.44	4.49
Non-Road Diesel	0.00	0.00	9.64	64.13	9.64	64.13
Miscellaneous	0.00	0.00	0.01	6.65	0.01	6.65
Miscellaneous						
Other Combustion	0.00	0.00	0.05	0.01	0.05	0.01
Health Services	0.00	0.00	0.00	0.00	0.00	0.00
Cooling Towers	0.00	0.00	0.00	0.00	0.00	0.00
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00
Totals	**34.26**	**282.81**	**303.52**	**256.07**	**337.78**	**538.18**

Table II-3
Input Values for Pittsburgh-Beaver Valley Area NONROAD Model Run

Parameter	Input Value
Fuel RVP, psi	8.8
Oxygen Weight %	0%
Gasoline Sulfur	0.03%
Diesel Sulfur	0.33%
Liquefied Petroleum Gas/Compressed Natural Gas Sulfur	0%
Minimum Temperature, °F	67
Maximum Temperature, °F	96
Average Ambient Temperature, °F	86

Table II-4
Recreational Marine Equipment Populations, 1999

SCC	SCC Description	State	Pittsburgh -Beaver Valley Area
2282005010	Mobile Sources Marine Vessels, Recreational Pleasure Craft, Gasoline 2-Stroke Outboards	246,851	13,015
2282005015	Mobile Sources Marine Vessels, Recreational Pleasure Craft, Gasoline 2-Stroke Sterndrive	33,370	1,759
2282010005	Mobile Sources Marine Vessels, Recreational Pleasure Craft, Gasoline 4-Stroke Inboards	51,613	2,722
2282020005	Mobile Sources Marine Vessels, Recreational Pleasure Craft, Diesel Inboards	5,292	287
2282020010	Mobile Sources Marine Vessels, Recreational Pleasure Craft, Diesel Outboards	71	4
Total		**337,197**	**17,787**

C. PERMANENT AND ENFORCEABLE CONTROL MEASURES

This section summarizes the permanent and enforceable control measures that contributed to the reductions in ozone precursor emissions from 1990 to 1999 in the Pittsburgh-Beaver Valley Area. Table II-5 presents a summary of the emissions data in Tables II-1 and II-2 for point sources, stationary area sources, highway vehicles, and nonroad engines/vehicles.

Table II-5
VOC and NO_x Emissions Summary: 1990 and 1999
Pittsburgh-Beaver Valley Area

	VOC Emissions (tons per day)	
Major Source Category	**1990**	**1999**
Point Sources	96	34
Stationary Area Sources	128	130
Highway Vehicles	150* (176)	110
Nonroad Engines/Vehicles	28# (82)	64
Total	**402**	**338**

		NO_x Emissions (tons per day)
Major Source Category	**1990**	**1999**
Point Sources	555	282
Stationary Area Sources	18	10
Highway Vehicles	144* (223)	171
Nonroad Engines/Vehicles	54# (83)	75
Total	**771**	**538**

* Highway vehicle emissions estimates for 1999 and beyond use newer techniques including an updated mobile model, more recent planning data and improved handling of truck VMT estimates. A revised estimate of the 1990 highway emissions using these improvements would result in emissions of 176 TPD for VOC and 223 TPD for NO_x.

Nonroad Engines/Vehicles emission estimates for 1999 and beyond use newer techniques including the EPA Nonroad Model. A revised estimate of the 1990 emissions using the Nonroad Model improvement would result in emissions of 82 TPD for VOC and 83 TPD for NO_x.

1. Point Sources

a. Reasonably Available Control Technology Regulations (RACT) and NOx MOU Phase II Rules

NO_x and VOC emissions from point sources are affected by RACT limits for major stationary sources established by Chapter 129.91 through 129.95 of the Pennsylvania Code (Title 25. Environmental Protection). Case-by-case RACT determinations were made, and any new control equipment installed by 1999. Further, Phase II of the NO_x Memorandum of Understanding requires certain sources (those with design capacities of 250 million British thermal units or more) to meet Phase II NO_x limits in 1999 (OTC, 1994). The reductions associated with the Phase II NO_x allowances are included in the 1999 emission estimates.

b. NESHAPS

Federal regulations under the National Emission Standards for Hazardous Air Pollutants (NESHAPS) covering by-product coke oven benzene emissions reduced VOC emissions as discussed in Pennsylvania's 15% Rate of Progress Plan.

c. Prevention of Significant Deterioration

The Clean Air Act established a program to review the impact that major new sources of air pollution would have on an area. The Prevention of Significant Deterioration (PSD) program requires new sources to implement Best Available Control Technology and conduct specific reviews to determine the new source's impact on the environment. Pennsylvania's PSD program was approved by EPA on August 21, 1984 (49 FR 33128).

d. New Source Review

New Source Review (NSR) is a permitting program that applies to new sources locating in nonattainment areas. The regulations require sources of NO_x and VOC to install lowest achievable emission reduction (LAER) control equipment and obtain offsets. Offsets are emission reductions that occur at another source. The new source must obtain offsets at a rate of 1.15 tons of offsets for each 1 ton of potential emissions from the new source. Thus, overall emissions in the region would be reduced by this program. Pennsylvania's NSR program was approved by EPA on December 9, 1997 (62 FR 64722).

2. Stationary Area Source Control Measures

There are a number of national rules and State regulations affecting area source VOCs that contributed to the emission reductions that occurred between 1990 and 1999. These include rules affecting the following source categories: automobile refinish coatings, consumer products, architectural and industrial maintenance (AIM) coatings, wood furniture coating, aircraft surface coating, and marine surface coating.

a. Automobile Refinish Coatings

Provisions of national VOC emission standards for automobile refinish coatings apply to automobile refinish coatings and coating components manufactured on or after January 11, 1999 for sale and distribution in the United States. It is estimated in this analysis that the national rule will be fully effective during the 1999 ozone season. A 37 percent reduction in VOC emissions is estimated.

b. Consumer Products

Provisions of national VOC emission standards for consumer products apply to consumer products manufactured or imported on or after December 10, 1998 for sale or distribution in the United States. This rule applies to a variety of consumer products including adhesives, household products, and personal care products. This national rule was fully effective during the 1999 ozone season. This VOC reduction is estimated to be 0.8 pounds per capita annually, or a 20 percent control efficiency with a 48.6 percent rule penetration, consistent with a 1995 memorandum from John Seitz, and the rule penetration assumption used in the OTC model rule analysis (Seitz, 1995).

c. Architectural and Industrial Maintenance Coatings

Provisions of national VOC emission standards for architectural and industrial maintenance coatings apply to each architectural coating manufactured on or after September 13, 1999 for sale or distribution in the United States. For any architectural coating registered under the Federal Insecticide, Fungicide, and Rodenticide Act, the provisions of this subpart apply to any such coating manufactured on or after March 13, 2000 for sale or distribution in the United States. The VOC limits do not apply to:

1. Coatings to be sold outside the United States.
2. A coating that is manufactured prior to September 13, 1999.
3. A coating that is sold in a nonrefillable aerosol container.
4. A coating that is collected and redistributed at a paint exchange.
5. A coating that is sold in a container with a volume of one liter or less.

For all area source categories affected by the architectural coatings rule, less than 100 percent compliance was estimated for the 1999 ozone season because the national rule was not fully effective then. EPA allowed States to claim a 15 percent reduction in architectural and industrial maintenance (AIM) coatings VOC emissions in their 1996 rate-of-progress plans, so that 15 percent value is applied in this analysis for 1999 emission estimates.

d. Wood Furniture Coating

In December 1995, EPA promulgated a Title III standard to control hazardous air pollutant (HAP) emissions from wood furniture coating (60 FR 62930, 1995). The four basic wood furniture manufacturing operations that are included in the affected emission source are: finishing, gluing, cleaning, and washoff operations. EPA estimated that the Wood Furniture Finishing MACT standard would reduce volatile HAP emissions by approximately 60 percent. In May 1996, EPA issued the final Control Techniques Guideline (CTG) document for control of VOC emissions from wood furniture manufacturing operations. EPA estimated that the application of presumptive RACT by facilities in ozone nonattainment areas and the ozone transport region would lead to a 31 percent reduction from current levels in VOC emissions from the wood furniture industry (EPA, 1996). In this analysis, a 30 percent VOC control efficiency was applied.

e. Aircraft Surface Coating

EPA promulgated the Aerospace Manufacturing National Emission Standard for Hazardous Air Pollutants (NESHAP) on September 1, 1995 (60 FR 45948, 1995). The final rule affects over 2,800 major source facilities that produce or repair aerospace vehicles or vehicle parts, such as airplanes, helicopters, and missiles (EPA, 1995). The rule was estimated to lead to a reduction in HAP emissions, many of which are also VOCs, by 60 percent, by 1998. A 60 percent VOC reduction is applied in this analysis.

f. Marine Surface Coating

In December 1995, EPA issued a NESHAP for shipbuilding and ship repair based on the maximum HAP limits for 23 types of marine coatings. To comply with the NESHAP, affected facilities may not apply any marine coating with a HAP content in excess of the applicable limit, and are required to implement the work practices specified in the rule. Most, if not all, existing *major source* shipyards are located in ozone nonattainment areas, and will have to control VOC emissions under Title I in addition to Title III (EPA, 1994). EPA developed the CTG for this source category in parallel with the NESHAP because of the overlap involving coating limits. The controls required for complying with the NESHAP also apply to VOCs, and constitute draft recommended best available control measures. A 24 percent VOC reduction is applied in this analysis (Serageldin, 1994) which is consistent with EPA estimates.

g. Treatment Storage and Disposal Facilities

Phase II Federal standards for facilities that manage hazardous wastes containing VOC's were promulgated by EPA on December 8, 1997. This results in a 94% reduction with a rule effectiveness of 80%.

h. Refueling Controls (Stage II)

Pennsylvania implemented a Stage II refueling program in the area. This program required vapor recovery nozzles on gasoline pumps which ensure that the gasoline vapors from the filling of motor vehicle gasoline tanks are collected and returned to the service station's storage tanks. This program was effective for 120,000 gallon per month stations and new stations starting in 1999. Emission reduction credit was therefore only taken for 44 percent of gasoline sales in the area.

3. Highway Vehicles

Even with the increase in VMT that occurred from 1990 to 1999, highway vehicle emissions of VOC decreased by 27 percent from 1990 to 1999, while NO_x emissions increased by 27 percent over the same time period using the old 1990 baseline data. Using the updated techniques consistent with the 1999 techniques, as shown previously in Table II-5 would show a VOC reduction of 38% and a NO_x reduction of 18%. These reductions can be attributed to a combination of the FMVCP (fleet turnover), the enhanced auto emissions testing program and lower gasoline volatility.

a. Federal Motor Vehicle Control Program (FMVCP)

The emission reductions from the FMVCP covering fleet turnover are permanent reductions. The effects of fleet turnover will continue to bring about significant reductions in highway vehicle emissions

Tier 1 tailpipe standards established by the CAA Amendments of 1990 include NO_x, VOC, and CO limits for light-duty gasoline vehicles (LDGVs) and light-duty gasoline trucks (LDGTs). These standards began to be phased in starting in 1994. NO_x standards are also specified for heavy-duty gasoline and diesel vehicles.

Evaporative VOC emissions has also been reduced in gasoline-powered cars as new Federal evaporative test procedures are used. New testing programs include the events of pre-conditioning, diurnal heat builds and exhaust, running loss, and hot soak tests.

Section 202 of the CAA Amendments of 1990 required EPA to regulate vehicle refueling emissions by requiring onboard emission control systems that would provide a minimum evaporative capture efficiency of 95 percent. In 1994, EPA issued a final rule implementing the control of vehicle refueling emissions through the use of vehicle-based systems. It applies to light-duty vehicles and light-duty trucks. The 1999 MOBILE5b runs include the effects of these standards.

b. Gasoline Volatility

The reduction in emissions attributable to the regulation of gasoline RVP is permanent and enforceable. A June 11, 1990 *Federal Register* notice set standards for fuel volatility by State for the summer ozone season that apply May through September. Phase I of these standards applied in 1989 through 1991. The Phase II standards, which are expressed in psi, apply in 1992 and subsequent years. These standards limit gasoline volatility to 9.0 psi in American Society for Testing and Materials Class C areas (Pennsylvania).

In 1999, the applicable summertime RVP standard, as required by the SIP approved PA gasoline volatility regulation Chapter 126 Subchapter C, for 1998 and subsequent years is 7.8 psi.

c. Automobile Emissions Test and Repair Program

A portion of the reduction in emissions is also attributable to the enhancement of the automobile emissions testing program initiated in October 1997. This program is an annual idle repair inspection program which also includes several anti-tampering visual inspections and a gas cap check.

CHAPTER III
STATE IMPLEMENTATION PLAN APPROVAL

One of the conditions of being redesignated to attainment is that the applicable implementation plan has been fully approved by EPA under Section 110(k) of the CAA. Another is that the State has met all applicable requirements for the area under Section 110 and Part D. This chapter addresses these two criteria.

EPA approved Pennsylvania's 1990 baseline VOC emission inventory on January 14, 1998. A 1990 baseline NOx inventory was submitted to EPA at the same time as the VOC inventory (with final submission of the 15 percent plan).

The stationary air pollution sources in the Pittsburgh-Beaver Valley Area during 1990 to 1999 were subject to the regulations of the Commonwealth of Pennsylvania, Pennsylvania Code in Title 25 Environmental Resources, Chapters 121-143. These regulations include Standards of Performance for New Stationary Sources promulgated by EPA under the Clean Air Act; Standards for Contaminants; National Emission Standards for Hazardous Air Pollutants; Construction, Modification, Reactivation and Operation of Sources; Alternative Emission Reduction Limitations; and Standards for Sources. Pennsylvania has federally approved programs for prevention of significant deterioration (PSD) , new source review and reasonably available control technology.

Pennsylvania adopted and implemented in 1997 an enhanced inspection and maintenance (I/M) program in the area. EPA approved Pennsylvania's I/M program on June 8, 1999.

EPA and the U.S. Department of Transportation (DOT) have issued regulations regarding criteria and procedures for demonstrating and assuring conformity of transportation improvement programs (TIP or program), long range plans (LRP or plan), and individual transportation projects with the requirements of the CAA and the SIP for the specific nonattainment area. Pennsylvania and Southwest Pennsylvania Commission have each complied with the conformity rules found in 40 CFR Part 51, issued November 24, 1993. On November 21, 1994, Pennsylvania submitted a Transportation Conformity SIP amendment to EPA. EPA subsequently revised its rules, requiring states to adopt new SIPs. Pennsylvania submitted such a SIP revision to EPA on August 11, 1998. Subsequently, a series of court actions overturned portions of the rule. EPA will again have to revise its rule. Pennsylvania and affected transportation planning organizations are complying with EPA guidance implementing changes not yet incorporated into regulation.

All transportation conformity analytical and test requirements have been applied in this nonattainment area. The nonattainment area has met all data and analytic requirements of 40 CFR Part 51, including the use of EPA's most recent approved mobile emissions modeling tool and emissions analysis for specified milestone years, incorporation of the most recent planning assumptions into the analysis, and emissions base calculation procedures. All process requirements included in 40 CFR Part 51 have been followed, including, but not limited to, public involvement, consideration and approval by the metropolitan planning organization. 40 CFR Part 51 was first implemented in the nonattainment area in 1994, with an affirmative TIP and LRP conformity finding by DOT in October 1994. The most recent conformity determination was approved by Federal Highway Administration on September 29, 2000.

In consideration of the above, the applicable implementation plan is approvable by EPA under Section 110(k) and meets all applicable requirements for the Pittsburgh-Beaver Valley Area under Section 110 and Part D.

CHAPTER IV
MAINTENANCE PLAN

Section 107(d)(3)(E) of the CAA states that a maintenance plan must be fully approved by EPA before an area can be redesignated as attainment for ozone. The maintenance plan is considered a SIP revision under Section 110 of the CAA and must show that the NAAQS for ozone will be maintained for at least 10 years after redesignation. The plan must also include contingency measures to address any violation of the NAAQS standard.

One of the requirements for ensuring that ozone levels in the Pittsburgh-Beaver Valley Area remain below the standard is to show that future emissions over the 10-year period of analysis will not lead to any exceedances of the standard. Emission estimates for 2007 and 2011 have been developed for this purpose. NO_x, and VOC emission levels will continue to decline from attainment year levels despite growth in population, economic output, and VMT.

The year 2011 was determined to be the appropriate one for preparation of this maintenance plan through consultation with EPA Region III staff. Emission projections have also been developed for 2007 to provide insight into emission levels trends at an interim point during the maintenance period.

A. GROWTH PROJECTIONS: 2007 and 2011

This section describes the data, methods, and assumptions used in developing estimates of emissions growth between 1999 and the two projection years – 2007 and 2011. It first presents the data sources and methods used in developing emissions growth factors for stationary area and non-electricity generating unit (EGU) point sources. Nonroad area source, highway vehicle source and EGU point source growth estimates are described subsequently.

1. Stationary Area and Non-EGU Point Sources

As indicated by Table IV-1, stationary area source emission growth factors were generally derived from EGAS Version 4.0 and regional projections of industrial sector economic output prepared by Standard and Poor's DRI (Pechan, 2001; Smith, 1999). Point sources covered by the EPA NOx SIP Call were grown in accordance with the federal NOx SIP Call.

Table IV-1
Overview of Emission Growth Surrogate Data Used for Stationary Area and Non-EGU Point Sources

Sector	Source Categories	Data Source
Stationary Area	All SCCs except below	EGAS 4.0 SCC-level output for Pittsburgh-Beaver Valley Area
	SCCs with base year emissions derived from per capita emission factors	EGAS 4.0 population forecast for Pittsburgh-Beaver Valley Area (1996-2007 = 6% growth; 1996-2011 = 7.7% growth)
Non-EGU Point	Non-EGU sources	EPA SIP Call growth projections

a. Stationary Area Sources

To develop estimates of emissions growth for stationary area sources, EGAS 4.0 was run in SCC-output mode for Pittsburgh-Beaver Valley Area for 2007 and 2011. The EGAS 4.0 SCC-output option was used because the area source component of the Pittsburgh-Beaver Valley Area inventory does not contain SIC code information that can be used to link with the EGAS 2-digit SIC-output option. The EGAS 2007 and 2011 emission growth factors represent growth from a 1996 base year. These SCC-level growth factors were applied to stationary area SCCs in the 1996 inventory to represent emissions growth excluding the effects of future year controls.

An exception to the use of EGAS SCC-based growth factors was made for the seven solvent utilization area source categories whose base year emission estimates are calculated using per capita emission factors. Population-based growth factors from EGAS 4.0 were linked to these source categories to project 1996-2007 and 1996-2011 emissions growth. The seven solvent utilization area source categories whose base year emissions estimates are based on per capita emissions factors are:

- SCC 2401001000 - Surface Coating, Architectural Coatings;
- SCC 2401005000 - Surface Coating, Auto Refinishing: SIC 7532;
- SCC 2401008000 - Surface Coating, Traffic Markings;
- SCC 2401100000 - Surface Coating, Industrial Maintenance Coatings;
- SCC 2415300000 - Degreasing, All Industries: Cold Cleaning;
- SCC 2415360000 - Degreasing, Auto Repair Services (SIC 75); and
- SCC 2465000000 - Miscellaneous Non-industrial: Consumer, All Products/Processes.

(EGAS 4.0 already uses population data as the emissions growth surrogate indicator for one of these seven categories [SCC 2465000000–Miscellaneous Non-Industrial: Consumer, All Products], but uses constant dollar output data as the surrogate indicator for the remaining six categories.)

Section D describes the post-base year control assumptions that were applied to estimate the final 2007 and 2011 year area source emission estimates.

b. Non-EGU Point Sources

Non-EGU point source growth was projected using the same methods that EPA used in their NO_x SIP Call analysis. EPA used Bureau of Economic Analysis (BEA) growth projections. A detailed discussion of this growth estimate can be found in the October 27, 1998 Federal Register (63 FR 57356).

2. EGU-Point Source Growth Factors

Projected growth in EGU emissions in Pennsylvania was estimated using the same methods that EPA used in their NO_x SIP Call analysis. A detailed discussion of this growth estimate can be found in the October 27, 1998 Federal Register (63 FR 57356). The EPA used the IPM model to estimate EGU growth throughout the eastern United States and correlated that to heat input increases. The IPM results estimated a 15% increase in heat input from 1996 through 2007 for the state of Pennsylvania. This 15 percent increase in expected EGU generation between 1996 and 2007 was converted to an annual growth rate of 1.36 percent to estimate appropriate growth factors for 1999 and 2011. A complete explanation of the IPM model can be found at the EPA website: www.epa.gov/capi/.

3. Highway Vehicles and Nonroad Sources

As with the 1999 highway vehicle emission estimates, MOBILE5b was used to estimate highway vehicle emission factors by vehicle type. The primary difference between the 1999 emission calculation assumptions and those used for the two future years, is the implementation of the federal Tier II Regulation. A summary of the highway vehicle emission modeling assumptions and the methods used for estimating growth in highway vehicle travel are described in detail in Appendix A.

Similar to the 1999 base year emission estimates, projection year emissions for the majority of nonroad mobile sources were developed using EPA Office of Transportation and Air Quality's June 2000 draft NONROAD model. The NONROAD model estimates emissions for diesel, gasoline, liquefied petroleum gasoline, and compressed natural gas-fueled nonroad equipment types. Certain nonroad categories, including commercial marine, aircraft, and locomotives, are not included in the model. Projection year estimates for these categories were developed similar to those used for area sources.

B. ATTAINMENT EMISSIONS INVENTORY

The 1999 base year emissions data that were presented in Table II-2 were used along with the growth and control factors described in this chapter to estimate ozone precursor emissions in 2007 and 2011. The maintenance plan year is 2011. The year 2007 is an intermediate year that has been used for many national and regional ozone modeling studies and serves as a check point for maintenance plan evaluation. A detailed summary of 2007 VOC and NO_x emissions in Pittsburgh-

Beaver Valley Area is shown in Table IV-2. The 2011 maintenance plan year summary is shown in Table IV-3. Table IV-4 presents a comparison of VOC and NO_x emissions by major source category for 1999, 2007, and 2011.

C. PERMANENT AND ENFORCEABLE CONTROL MEASURES

This section describes the permanent and enforceable adopted control measures that take effect subsequent to 1999 that contribute to reductions in future year emissions.

1. Stationary Area Source Control Measures - VOC

a. Vehicle Refueling

Evaporative hydrocarbon emissions associated with the transfer of fuel from underground storage tanks to motor vehicles are known as refueling emissions. Vehicle refueling emissions are controlled through the national onboard vapor recovery rule promulgated in January of 1994. This rule applies to all light-duty gasoline vehicles (LDGVs) and light-duty gasoline trucks (LDGTs) with a phase-in period beginning with the 1998 model year and differing by vehicle type. MOBILE5b includes the effects of this rule in its VOC emission factors for gasoline powered vehicles. In addition, Pennsylvania has implemented a Stage II vehicle refueling program in the area. This program was fully implemented in December 2000. The program affects approximately 90 percent of the gasoline sold in the area.

b. Automobile Refinish Coatings

The national VOC emission standards for automobile refinish coatings apply to automobile refinish coatings and coating components manufactured on or after January 11, 1999 for sale and distribution in the United States (63 FR 48806, 1998). In addition, Pennsylvania has adopted mobile equipment repair and refinishing regulations that specify improved coating application equipment, spray gun cleaning practices, and worker training. It is estimated that these measures will result in an additional 38 percent reduction of VOC from these operations.

TABLE IV-2: Summary of 2007 Emissions (ozone season tons/day)

	Point Source		Area Source		Total	
	VOC	NO_x	VOC	NO_x	VOC	NO_x
						0.00
Coal	1.29	91.43	0.00	0.00	1.29	91.43
Oil	5.65	2.26	0.00	0.00	5.65	2.26
Gas	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Internal Combustion	0.10	3.70	0.00	0.00	0.10	3.70
						0.00
Coal	0.05	4.33	0.00	0.00	0.05	4.33
Oil	0.02	1.22	0.00	0.00	0.02	1.22
Gas	1.73	17.82	0.00	0.00	1.73	17.82
Other	0.01	0.00	0.00	0.00	0.01	0.00
Internal Combustion	0.85	18.70	0.00	0.00	0.85	18.70
						0.00
Commercial/Institutional Coal	0.11	1.32	0.00	0.00	0.11	1.32
Commercial/Institutional Oil	0.03	0.59	0.00	0.85	0.03	1.44
Commercial/Institutional Gas	1.03	9.90	0.00	2.08	1.03	11.98
Misc. Fuel Comb. (Except Residential)	0.05	0.03	0.00	0.00	0.05	0.03
Residential Other	0.00	0.00	0.17	4.13	0.17	4.13
						0.00
Organic Chemicals	0.16	0.00	0.00	0.00	0.16	0.00
Inorganic Chemicals	0.00	0.00	0.00	0.00	0.00	0.00
Polymers & Resins	4.92	0.02	0.00	0.00	4.92	0.02
Agricultural Chemicals	0.00	1.12	0.00	0.00	0.00	1.12
Paints, Varnishes, Lacquers, Enamels	1.56	0.01	0.00	0.00	1.56	0.01
Pharmaceuticals	0.00	0.00	0.00	0.00	0.00	0.00
Other Chemicals	1.58	0.00	0.00	0.00	1.58	0.00
						0.00
Non-Ferrous Metals Processing	0.24	0.61	0.00	0.00	0.24	0.61
Ferrous Metals Processing	5.56	31.51	0.00	0.00	5.56	31.51
Metals Processing NEC	0.32	0.06	0.00	0.00	0.32	0.06
						0.00
Oil & Gas Production	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refineries & Related Industries	0.01	0.00	0.00	0.00	0.01	0.00
Asphalt Manufacturing	0.01	0.02	0.00	0.00	0.01	0.02
						0.00
Agriculture, Food, & Kindred Products	0.28	0.00	1.16	0.00	1.44	0.00
Textiles, Leather, & Apparel Products	0.00	0.00	0.00	0.00	0.00	0.00
Wood, Pulp & Paper, & Publishing Products	0.00	0.00	0.00	0.00	0.00	0.00
Rubber & Miscellaneous Plastic Products	0.11	0.00	0.00	0.00	0.11	0.00
Mineral Products	0.38	13.54	0.00	0.00	0.38	13.54
Machinery Products	0.08	0.01	0.00	0.00	0.08	0.01
Electronic Equipment	0.04	0.00	0.00	0.00	0.04	0.00

Miscellaneous Industrial Processes	0.20	0.03	0.00	0.00	0.20	0.03
						0.00
Degreasing	1.51	0.00	23.02	0.00	24.53	0.00
Graphic Arts	0.15	0.01	8.13	0.00	8.28	0.01
Dry Cleaning	0.26	0.00	0.59	0.00	0.85	0.00
Surface Coating	2.62	0.02	50.14	0.00	52.76	0.02
Other Industrial	1.42	0.00	0.00	0.00	1.42	0.00
Nonindustrial	0.00	0.00	30.41	0.00	30.41	0.00
						0.00
Bulk Terminals & Plants	0.79	0.00	0.00	0.00	0.79	0.00
Petroleum & Petroleum Product Storage	1.43	0.00	0.00	0.00	1.43	0.00
Petroleum & Petroleum Product Transport	0.50	0.01	0.17	0.00	0.67	0.01
Service Stations: Stage I	0.00	0.00	0.44	0.00	0.44	0.00
Service Stations: Stage II	0.00	0.00	2.82	0.00	2.82	0.00
Service Stations: Breathing & Emptying	0.00	0.00	1.50	0.00	1.50	0.00
Organic Chemical Storage	0.80	0.00	0.00	0.00	0.80	0.00
Organic Chemical Transport	0.08	0.00	0.00	0.00	0.08	0.00
Inorganic Chemical Storage	0.00	0.00	0.00	0.00	0.00	0.00
Bulk Materials Storage	0.01	0.19	0.00	0.00	0.01	0.19
						0.00
Incineration	0.00	0.00	4.13	1.56	4.13	1.56
Open Burning	0.00	0.00	5.62	1.12	5.62	1.12
POTW	0.06	0.00	6.05	0.00	6.11	0.00
Industrial Waste Water	0.14	0.00	0.00	0.00	0.14	0.00
TSDF	0.00	0.00	0.29	0.00	0.29	0.00
Landfills	0.20	0.28	1.21	0.00	1.41	0.28
Other	0.00	0.00	0.00	0.00	0.00	0.00
						0.00
Light-Duty Gas Vehicles & Motorcycles	0.00	0.00	55.34	50.59	55.34	50.59
Light-Duty Gas Trucks	0.00	0.00	31.40	32.12	31.40	32.12
Heavy-Duty Gas Vehicles	0.00	0.00	4.92	9.90	4.92	9.90
Diesels	0.00	0.00	6.56	36.51	6.56	36.51
						0.00
Non-Road Gasoline	0.00	0.00	36.73	4.48	36.73	4.48
Non-Road Diesel	0.00	0.00	5.68	54.17	5.68	54.17
Miscellaneous	0.00	0.00	0.01	8.44	0.01	8.44
						0.00
Other Combustion	0.00	0.00	0.05	0.01	0.05	0.01
Health Services	0.00	0.00	0.00	0.00	0.00	0.00
Cooling Towers	0.00	0.00	0.00	0.00	0.00	0.00
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00
Totals	**36.34**	**198.73**	**276.54**	**205.95**	**312.88**	**404.68**

TABLE IV-3: Summary of 2011 Emissions (ozone season tons/day)

Source Category	Point Source VOC	Point Source NO_x	Area Source VOC	Area Source NO_x	Total VOC	Total NO_x
Fuel Comb. Elec. Utility						
Coal	1.36	91.43	0.00	0.00	1.36	91.43
Oil	5.96	2.26	0.00	0.00	5.96	2.26
Gas	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Internal Combustion	0.11	3.70	0.00	0.00	0.11	3.70
Fuel Comb. Industrial						
Coal	0.05	4.35	0.00	0.00	0.05	4.35
Oil	0.02	1.26	0.00	0.00	0.02	1.26
Gas	1.79	17.36	0.00	0.00	1.79	17.36
Other	0.01	0.00	0.00	0.00	0.01	0.00
Internal Combustion	0.89	19.60	0.00	0.00	0.89	19.60
Fuel Comb. Other						
Commercial/Institutional Coal	0.12	1.40	0.00	0.00	0.12	1.40
Commercial/Institutional Oil	0.03	0.59	0.00	0.82	0.03	1.41
Commercial/Institutional Gas	1.07	10.38	0.00	2.11	1.07	12.49
Misc. Fuel Comb. (Except Residential)	0.05	0.04	0.00	0.00	0.05	0.04
Residential Other	0.00	0.00	0.17	4.05	0.17	4.05
Chemical & Allied Product Mfg						
Organic Chemicals	0.16	0.00	0.00	0.00	0.16	0.00
Inorganic Chemicals	0.00	0.00	0.00	0.00	0.00	0.00
Polymers & Resins	5.19	0.02	0.00	0.00	5.19	0.02
Agricultural Chemicals	0.00	1.18	0.00	0.00	0.00	1.18
Paints, Varnishes, Lacquers, Enamels	1.65	0.01	0.00	0.00	1.65	0.01
Pharmaceuticals	0.00	0.00	0.00	0.00	0.00	0.00
Other Chemicals	1.67	0.00	0.00	0.00	1.67	0.00
Metals Processing						
Non-Ferrous Metals Processing	0.23	0.59	0.00	0.00	0.23	0.59
Ferrous Metals Processing	5.34	30.25	0.00	0.00	5.34	30.25
Metals Processing NEC	0.30	0.06	0.00	0.00	0.30	0.06
Petroleum & Related Industries						
Oil & Gas Production	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refineries & Related Industries	0.01	0.00	0.00	0.00	0.01	0.00
Asphalt Manufacturing	0.01	0.02	0.00	0.00	0.01	0.02
Other Industrial Processes						
Agriculture, Food, & Kindred Products	0.29	0.00	1.24	0.00	1.53	0.00
Textiles, Leather, & Apparel Products	0.00	0.00	0.00	0.00	0.00	0.00
Wood, Pulp & Paper, & Publishing Products	0.00	0.00	0.00	0.00	0.00	0.00
Rubber & Miscellaneous Plastic Products	0.12	0.00	0.00	0.00	0.12	0.00
Mineral Products	0.39	13.75	0.00	0.00	0.39	13.75
Machinery Products	0.09	0.01	0.00	0.00	0.09	0.01
Electronic Equipment	0.04	0.00	0.00	0.00	0.04	0.00

Miscellaneous Industrial Processes	0.21	0.03	0.00	0.00	0.21	0.03
Solvent Utilization						
Degreasing	1.60	0.00	24.37	0.00	25.97	0.00
Graphic Arts	0.15	0.01	8.68	0.00	8.83	0.01
Dry Cleaning	0.27	0.00	0.63	0.00	0.90	0.00
Surface Coating	2.66	0.02	54.01	0.00	56.67	0.02
Other Industrial	1.51	0.00	0.00	0.00	1.51	0.00
Nonindustrial	0.00	0.00	30.70	0.00	30.70	0.00
Storage & Transport						
Bulk Terminals & Plants	0.83	0.00	0.00	0.00	0.83	0.00
Petroleum & Petroleum Product Storage	1.46	0.00	0.00	0.00	1.46	0.00
Petroleum & Petroleum Product Transport	0.53	0.01	0.17	0.00	0.70	0.01
Service Stations: Stage I	0.00	0.00	0.45	0.00	0.45	0.00
Service Stations: Stage II	0.00	0.00	2.02	0.00	2.02	0.00
Service Stations: Breathing & Emptying	0.00	0.00	1.53	0.00	1.53	0.00
Organic Chemical Storage	0.84	0.00	0.00	0.00	0.84	0.00
Organic Chemical Transport	0.08	0.00	0.00	0.00	0.08	0.00
Inorganic Chemical Storage	0.00	0.00	0.00	0.00	0.00	0.00
Bulk Materials Storage	0.01	0.19	0.00	0.00	0.01	0.19
Waste Disposal & Recycling						
Incineration	0.00	0.00	4.50	1.70	4.50	1.70
Open Burning	0.00	0.00	5.74	1.15	5.74	1.15
POTW	0.06	0.00	6.59	0.00	6.65	0.00
Industrial Waste Water	0.15	0.00	0.00	0.00	0.15	0.00
TSDF	0.00	0.00	0.31	0.00	0.31	0.00
Landfills	0.21	0.30	1.32	0.00	1.53	0.30
Other	0.00	0.00	0.00	0.00	0.00	0.00
Highway Vehicles						
Light-Duty Gas Vehicles & Motorcycles	0.00	0.00	57.31	45.34	57.31	45.34
Light-Duty Gas Trucks	0.00	0.00	32.49	28.60	32.49	28.60
Heavy-Duty Gas Vehicles	0.00	0.00	4.88	10.22	4.88	10.22
Diesels	0.00	0.00	7.31	30.86	7.31	30.86
Off-Highway						
Non-Road Gasoline	0.00	0.00	32.49	4.34	32.49	4.34
Non-Road Diesel	0.00	0.00	4.49	46.77	4.49	46.77
Miscellaneous	0.00	0.00	0.01	9.34	0.01	9.34
Miscellaneous						
Other Combustion	0.00	0.00	0.05	0.01	0.05	0.01
Health Services	0.00	0.00	0.00	0.00	0.00	0.00
Cooling Towers	0.00	0.00	0.00	0.00	0.00	0.00
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00
Totals	**37.52**	**198.82**	**281.46**	**185.31**	**318.98**	**384.12**

Table IV-4
VOC and NO_x Emissions Summary: 1999, 2007, and 2011

	VOC Emissions (tons per day)		
Major Source Category	**1999**	**2007**	**2011**
Point Sources	34	36	38
Stationary Area Sources	130	136	142
Highway Vehicles	110	98	102
Nonroad Engines/Vehicles	64	42	37
Total	**338**	**313**	**319**

	NO_x Emissions (tons per day)		
Major Source Category	**1999**	**2007**	**2011**
Point Sources	282	199	199
Stationary Area Sources	10	10	10
Highway Vehicles	171	129	115
Nonroad Engines/Vehicles	75	67	60
Total	**538**	**405**	**384**

c. Architectural and Industrial Maintenance (AIM) Coatings

In 1998, EPA promulgated a national rule for reducing VOC emissions from specific types of AIM coatings (63 FR 48848, 1998). AIM coatings are used by contractors, industry, and households, and include: interior and exterior paints, industrial maintenance coatings, wood finishes, cement coatings, roof coatings, traffic marking paints, and specialty coatings. Provisions of national VOC emission standards for AIM coatings apply to each coating manufactured on or after September 13, 1999 for sale or distribution in the United States. For any coating registered under the Federal Insecticide, Fungicide, and Rodenticide Act, the provisions of this subpart apply to any such coating manufactured on or after March 13, 2000 for sale or distribution in the United States.

The national rule is assumed to be fully effective in 2007 and 2011. The EPA estimated a 20.2 percent reduction in baseline emissions from this rule after accounting for losses in emission reductions due to the rule's exceedance fee and tonnage exemption

(Herring, 1999). For this analysis, a 20 percent reduction was applied to the above three source categories in both 2007 and 2011.

d. Wood Furniture Coating

In December 1995, EPA promulgated a Title III standard to control hazardous air pollutant (HAP) emissions from wood furniture coating (60 FR 62930, 1995). The four basic wood furniture manufacturing operations that are included in the affected emission source are: finishing, gluing, cleaning, and wash-off operations. In May 1996, EPA issued the final Control Techniques Guideline (CTG) document for control of VOC emissions from wood furniture manufacturing operations. Pennsylvania adopted regulations in June, 2000 that implement the provisions of the CTG. EPA estimated that the application of presumptive RACT by facilities in ozone nonattainment areas and the ozone transport region would lead to a 31 percent reduction from current levels in VOC emissions from the wood furniture industry (EPA, 1996). In this analysis, a 30 percent VOC control efficiency was applied.

e. Metal Furniture Coating

Under Title III of the CAA, by November 2000, EPA is scheduled to regulate HAP emissions (including VOC) from metal product coating operations. HAPs are to be regulated initially based on maximum achievable control technology (MACT). A 30 percent VOC reduction is assumed in 2007 for the future MACT standard for this category which is consistent with EPA estimates.

f. Aircraft Surface Coating

EPA promulgated the Aerospace Manufacturing National Emission Standard for Hazardous Air Pollutants (NESHAP) on September 1, 1995 (60 FR 45948, 1995). The final rule affects over 2,800 major source facilities that produce or repair aerospace vehicles or vehicle parts, such as airplanes, helicopters, and missiles (EPA, 1995). In addition, in April, 1999 Pennsylvania adopted regulations implementing the VOC control provisions for aerospace coating operations defined in EPA's CTG for the industry. The rule was estimated to lead to a reduction in HAP emissions, many of which are also VOCs, by 60 percent, by 1998. A 60 percent VOC reduction is applied in this analysis.

g. Marine Surface Coating

In December 1995, EPA issued a NESHAP for shipbuilding and ship repair based on the maximum HAP limits for 23 types of marine coatings. To comply with the NESHAP, affected facilities may not apply any marine coating with a HAP content in excess of the applicable limit, and are required to implement the work practices specified in the rule. Most, if not all, existing *major source* shipyards are located in ozone nonattainment areas, and will have to control VOC emissions under Title I in addition to Title III (EPA, 1994). EPA developed the CTG for this source category in parallel with the NESHAP because of the overlap involving coating limits. The controls required for complying with the NESHAP also apply to VOCs, and constitute draft recommended best available control measures. A 24 percent VOC reduction is applied in this analysis (Serageldin, 1994) which is consistent with EPA estimates.

h. Municipal Solid Waste Landfills

The regulation of municipal solid waste landfills under the authority of the CAA will occur under both Title I and Title III. Title I regulations for this source category were proposed in May 1991, and promulgated in March 1996 (61 FR 9905, 1996). The national rule represents a New Source Performance Standard regulation for new municipal solid waste landfills under Section 111(b) of the CAA, and an emission guideline for existing landfills under Section 111(d). The rule regulates emissions of methane and nonmethane organic compounds, including VOC, HAPs, and odorous compounds. Required controls include a gas collection system, and a control device capable of reducing nonmethane organic compounds in the collected gas by 98 weight-percent. The national emission reduction expected from the emission guideline is 53 percent. In this analysis, a VOC control efficiency of 98 percent and rule penetration of 54 percent have been assumed. The rule penetration value reflects the fraction of landfill emissions that are affected by this rule.

2. Point Source Control Measures

The Commonwealth adopted 25 PA Code Chapter 145. This regulation establishes a cap on NO_x emissions from large sources beginning in the ozone season of 2003. The regulation applies to large EGUs rated at greater than 25 megawatts and large non-EGUs rated at greater than 250 mmBtu/hr. These sources are provided a fixed number of NO_x allowances for each ozone season. A NO_x allowance is the authorization to emit one ton of NO_x. The regulation allows affected sources to trade or sell allowances in order to achieve cost effective controls. The Chapter 145 regulation was modeled after the EPA Section 126 model rule published on January 18, 2000 in the Federal Register (65 FR 2674). The EPA analysis of the modeling program indicated that trading would not have a significant impact on local nonattainment areas. While the Department agrees with this conclusion, the Department will review the impact of trading on the Pittsburgh/Beaver Valley Area caused by trading NO_x allowances. Because the EGU budget is to be implemented via a trading program, in practice, 0.15 pounds NO_x per million British thermal units will be the average emission rate. Individual units will emit at higher, or lower, emission rates than this. Pennsylvania's attainment plan assumes that emission reductions will be achieved by all states subject to the NOx SIP Call. These reductions are necessary for Pittsburgh-Beaver Valley Area to achieve and maintain the one-hour ozone standard.

3. Highway Vehicle and Nonroad Measures

There are a number of permanent and enforceable measures that are expected to further reduce highway vehicle emission rates, so that they are lower in 2007 and 2011 than they are in 1999. The measures discussed below are in addition to those already listed in Chapter II, i.e., those that affected emissions in 1999.

Highway vehicle emissions in the OTC states will be reduced during the maintenance plan period by the NLEV Program. On March 9, 1998, EPA found the NLEV program to be in effect. Nine northeastern States and 23 manufacturers opted in to this program, and the opt-ins met the criteria set forth by EPA in its NLEV regulations. As a result, starting in model year 1999 in Pennsylvania – and other OTC States – new cars and light trucks meet NLEV emission standards.

EPA determined that additional reductions in NO_x and VOC emissions are needed from heavy-duty vehicles, and promulgated a new national emission standard, which is referred to as the HDDV 2.0 grams per brake horsepower-hour NO_x standard. This standard reduces HDDV emissions beginning with the 2004 model year

In 2000, EPA also established Tier 2 motor vehicle emission standards and gasoline sulfur control requirements. This set of emission standards reduces emissions from new passenger cars and light trucks, including pickup trucks, vans, minivans, and sport utility vehicles. The program is a comprehensive regulatory initiative that treats vehicles and fuels as a system, combining requirements for much cleaner vehicles with requirements for much lower levels of sulfur in gasoline.

This plan does not include emission reductions expected after 2007 from even more stringent standards for heavy-duty diesel powered trucks as well as highway diesel fuel sulfur control requirements. This rule was finalized by EPA in December 2000 and reaffirmed by the EPA Administrator on February 20, 2001.

While nonroad equipment populations increase between 1999 and 2007, and increase again between 2007 and 2011, nonroad VOC and NO_x emissions are declining over this same period, due primarily to implementation of the following Federal permanent and enforceable measures:

- Tier 1, Tier 2, and Tier 3 compression-ignition standards for diesel engines greater than 50 horsepower;
- Tier 1 and Tier 2 compression-ignition standards for diesel engines below 50 horsepower;
- Phase 1 and Phase 2 of the spark-ignition standards for gasoline engines less than 25 horsepower; and
- Recreational spark-ignition marine engine controls.

D. MOTOR VEHICLE EMISSION BUDGETS FOR TRANSPORTATION CONFORMITY

Pennsylvania proposes to establish new ceilings for highway emissions in order to ensure that transportation emissions do not impede clean air goals in the next decade. The Clean Air Act Amendments (Section 176c) provides a mechanism by which federal funded or approved highway and transit plans, programs and projects are determined not to produce new air quality violations, worsen existing violations or delay timely attainment of national air quality standards. EPA regulations issued to implement transportation conformity provides that motor vehicle emission “budgets” establish caps of these emissions which cannot be exceeded by the predicted transportation system emissions in the future. Transportation agencies in Pennsylvania are responsible for making timely transportation conformity determinations. The Southwest Pennsylvania Commission holds that responsibility for the Pittsburgh-Beaver Valley area.

The following, once they are determined to be adequate for purposes of conformity by EPA, will establish transportation conformity budgets for the seven-county Pittsburgh area. DEP will revise these budgets with EPA's new modeling tool, MOBILE6, at an appropriate time.

Table IV-5: Motor Vehicle Emission Budgets

POLLUTANT	VOCs	NOx
1999	99,472 kg/day 109.65 tons/day	155,176 kg/day 171.05 tons/day
2007	89,102 kg/day 98.22 tons/day	117,136 kg/day 129.12 tons/day
2011	92,533 kg/day 102 tons/day	104,343 kg/day 115.02 tons/day

E. CONTINGENCY MEASURES

The Commonwealth of Pennsylvania will track the attainment status of the ozone NAAQS in the Pittsburgh-Beaver Valley Area by reviewing air quality and emissions data during the maintenance period. The Commonwealth will develop periodic emission inventories (every 3 years) beginning in 2002, and will evaluate these periodic inventories to see if they exceed the baseline (1999) maintenance inventory by more than 10 percent. If a 10 percent exceedance occurs, the Commonwealth will evaluate whether any further emission control measures should be implemented.

Contingency measures would also be considered if an ozone NAAQS exceedance occurs. If an exceedance occurs, the Commonwealth will evaluate whether additional emission control measures should be implemented. The Commonwealth of Pennsylvania contingency plan will be triggered in the event of a monitored violation of the ozone standard. A violation means recording four exceedances of the ozone NAAQS within a consecutive 3-year period at a specific monitoring site. If a violation occurs, the Commonwealth will adopt additional emission reductions, as expeditiously as practicable, in accordance with the Pennsylvania Air Pollution Control Act to return the area to attainment with the health-based one-hour standard. The Commonwealth will also continue to operate the air monitoring network in accordance with 40

CFR 58, with no reductions in the number of sites from those in the existing network unless pre-approved by EPA.

Contingency plan measures include the four VOC model rules currently being considered as additional measures for the Philadelphia Ozone Nonattainment Area. The VOC model rules have the potential to reduce emissions from consumer products, portable fuel containers, AIM coatings and solvent cleaning operations.

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APPENDIX A

Highway Vehicle Emissions Inventories and Forecasts for the Pittsburgh 7-County Nonattainment Area

An Explanation of Methodology

Prepared for:

Mobile Sources Section, Bureau of Air Quality
Pennsylvania Department of Environmental Protection
RCSOB, 400 Market Street, 12th Floor
Harrisburg, PA 17105-8468

Air Quality Section
Pennsylvania Department of Transportation
6th floor Forum Place, 555 Walnut Street
Harrisburg, PA 17101-1900

Prepared by:

Michael Baker, Jr., Inc.
801 Cromwell Park Dr., Suite 110
Glen Burnie, MD 21061

Urbitran/Garmen
150 River Road, Building E
Montville, NJ 07045

March 2001

Highway VehicleEmissions Inventories and Forecasts for
The Pittsburgh 7-County Non-attainment Area
An Explanation of Methodology
March 2001

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PITTSBURGH 7-COUNTY NON-ATTAINMENT AREA EMISSIONS INVENTORIES

The 1990 Inventory

The 1990 baseline inventory presented in this SIP is the one submitted in Pennsylvania's previous SIP. Highway vehicle emissions estimates for 1999 and beyond use newer techniques such as a more current MOBILE model, more accurate truck emission rates provided by EPA and improved handling of truck VMT estimates. These improved techniques would have increased our emission estimates for 1990.

DEP has therefore also prepared a revised estimate of the 1990 highway emissions using these improvement techniques so that the public can compare emissions estimated with similar techniques.

Changes To Modeling Methodology and Input Parameters for 1999, 2007 and 2011

The emissions inventory for the Pittsburgh 7-County Non-attainment Area reflects the highway mobile source emission projections. Emissions for 1999, 2007 and 2011 were calculated using EPA's MOBILE model version 5B with Pennsylvania's latest planning assumptions and data sources that include 1999 traffic counts from PennDOT's Roadway Management System (RMS) and Highway Performance Management System (HPMS).

For these years, three additional federal control strategies have been added to the planning assumptions for the Pittsburgh area. They include the new 2004 NOx standard for heavy-duty diesel engines (HDE), the national low emission vehicle (NLEV) standard for light-duty gasoline fueled vehicles, and the Tier 2 program which provides new federal emission standards on all vehicles designed for passenger use in the future. Other planning assumptions and methodologies remain consistent with previous SIP submittals for the Pittsburgh 7-county ozone non-attainment area.

The new HDE NOx standard was promulgated in October 1997 and combined emission standards of NOx and non-methane hydrocarbons (NMHC) from model year 2004 and later heavy-duty diesel engines used in trucks and buses. Manufacturers of such engines have the choice of certifying their new engines to either a 2.4 g/bhp-hr NMHC plus NOx standard, or to a 2.5 g/bhp-hr NMHC plus NOx standard with a limit of 0.5 g/bhp-hr on NMHC.

The NLEV program started in the northeast with 1999 model year light-duty cars and trucks (up to 6,000 pounds gross vehicle weight) and nationally with 2001 model year vehicles. The program ensures that most new vehicles sold meet emission standards significantly more stringent than Tier 1 vehicles. It will be superceded by the Tier 2 program beginning with 2004 model year vehicles. The NLEV program was developed as a consensus among Ozone Transport Region states and the automobile manufacturers and is now enforced by EPA as a federal program. NLEV benefits were calculated using EPA's MOBILE5 Information Sheet #6.

The Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements (Tier 2 standards) for passenger cars, light trucks, and larger passenger vehicles will phase in more stringent emission standards starting with the 2004 model year. It affects larger vehicles than the NLEV program.

Lower sulfur fuel to be available in 2004 ensures the effectiveness of low emission control technologies. The program is designed to focus on reducing the emissions most responsible for the ozone and particulate matter (PM) impact from these vehicles. Tier 2 benefits were calculated using EPA's MOBILE5 Information Sheet #8.

<u>The key elements to the modeling protocol for 1999, 2007 and 2011 are outlined below:</u>

Network Data Input

The inventory analysis runs utilize an input data source incorporating recently acquired 1999 Roadway Management System (RMS) data for each county. The RMS database contains physical characteristics and traffic volumes for state route segments throughout the state. Traffic volumes are adjusted to a July weekday using the most recent (1999) seasonal adjustment factors developed by PennDOT's Bureau of Planning and Research. The traffic volume data is used to compile VMT by county, area group, and functional class which is then adjusted to match the reported HPMS VMT totals for 1999.

Future year volumes for individual RMS roadway segments are developed from factors prepared by the Bureau of Planning and Research in an annual traffic factor report. Factors from 1995-1999 are utilized to extrapolate future growth in the Pittsburgh region.

PPAQ (Post-Processor for Air Quality)

The PPAQ software system continues to be used for speed calculations, preparation of MOBILE input files, and processing of MOBILE output files. The software has gone through several updates to refine the software and increase its capability and flexibility.

US EPA's MOBILE Model

The modeling was performed using EPA's approved MOBILE model, version MOBILE5B.

I/M Credit Data Files

EPA periodically updates their I/M credit files as new cutpoints are established. The new files can be easily downloaded from the EPA OMS or TNN websites. EPA's latest I/M credit data file for Tech IV+ vehicles (1981+ model years) is the IMDATA4.D. The I/M credit file for Tech I and II vehicles (pre-1981 model years) is TECH12.D

Pittsburgh 7-County Area – PA97 I/M Program for 4 counties

The PA97 I/M program is included for Allegheny, Beaver, Washington, and Westmoreland counties. The remaining three counties do not assume an I/M program. The PA97 I/M program includes:

- 2-speed idle test (1981 MY and newer)
- idle test (1975 – 1980 MY)
- anti-tampering (1975 and newer MY)
- gas cap pressure check (1975 and newer)

Vehicle Age Distributions

Vehicle age distributions are input to MOBILE for each county based on registered vehicles that reflect July 1 summer conditions. These distributions reflect the percentage of vehicles in the fleet up to 25 years old and are listed by the eight EPA vehicle types. The updated vehicle age distributions have been acquired for this inventory submission from PennDOT Bureau of Motor Vehicles Registration Database. The modeling utilizes vehicle age distributions from July 1999.

Vehicle Type Distributions:

Distributions have been created to divide the VMT to each of the eight MOBILE vehicle types needed for emission calculations. The vehicle type distributions were developed using a similar methodology as used in previous SIP submissions but with updated input data. The distributions were developed from the combination of MOBILE5B defaults for 1999, 1999 RMS truck percentages, and 1999 PennDOT hourly traffic data.

Summaries of significant parameters are shown in Table 1.

TABLE 1: MOBILE MODELING PARAMETERS

Analysis Year	1990 Inventory	1990 Recalculation	1999	2007
Mobile Model	MOBILE5a	MOBILE5B	MOBILE5B	MOBILE5B
PPAQ Version	PPAQ1 Ver 2.5	PPAQ1 Ver 4.0	PPAQ1 Ver 4.0	PPAQ1 Ver 4.0
Input Network Data	1990 RMS	1990 RMS	1999 RMS	1999 RMS
Speed Calculation Method	PPAQ by Hour	PPAQ by Hour	PPAQ by Hour	PPAQ by Hour
HPMS Adjustments	Adjusted to 1990 HPMS	Adjusted to 1990 HPMS	Adjusted to 1999 HPMS	Adjusted to 1999 HPMS
Seasonal Adjustments	July Weekday	July Weekday	July Weekday	July Weekday
Time Periods	4 (AM, Midday, PM & Night)	4 (AM, Midday, PM & Night)	4 (AM, Midday, PM & Night)	4 (AM, Midday, PM & Night)
VMT Growth	Actual 1990 HPMS	Actual 1990 HPMS	Actual 1999 HPMS	PennDOT Growth Factors to '07
Vehicle Age Distribution	1993	1993	1999	1999
HDDV Age Distribution	1990 Defaults	1990 Defaults	MOBILE6 Defaults (1996)	MOBILE6 Defaults (1996)
Vehicle Fleet (VMT Mix) Distribution	1990 PennDOT Traffic Info / MOBILE4 Defaults	1990 PennDOT Traffic Info / MOBILE5b Defaults	1999 PennDOT Traffic Info / MOBILE5b	1999 PennDOT Traffic Info / MOBILE5b
Temperatures	1993 SIP Temps	1993 SIP Temps	1993 SIP Temps	1993 SIP Temps
I/M Program	Basic I/M (Alle, urban zip codes in Beav, Wash, West)	Basic I/M (Alle, urban zip codes in Beav, Wash, West)	PA97 (Alleg, Beaver, Wash, Westmld)	PA97 Alleg, Beaver, Wash, Westmld)
I/M Cutpoints	Default	Default	Default	Default
ATP	None	None	7 inspections	7 inspections
Gas Cap	None	None	Yes (All MY)	Yes (All MY)
RVP / RFG	8.4	8.4	7.8 / No	7.8 / No
NLEV	No	No	Yes	Yes
NLEV Flags	N/A	N/A	99 1 1	99 1 1
2004 HDE Standard	N/A	Updated 1990 HDDV BERs	Yes	Yes
Tier II*	No	No	Yes	Yes

* Emission benefits calculated with off-model spreadsheet

INTRODUCTION

The purpose of this document is to explain how Pennsylvania estimates emissions from highway vehicles for inclusion in its emission inventories and State Implementation Plans.

Overview of Emissions Inventories

Under the Clean Air Act Amendments of 1990, Pennsylvania is required to develop emission inventories for ozone precursors -- volatile organic compounds (VOC) and nitrogen oxides (NOx). A baseline 1990 inventory was required statewide. Two ozone nonattainment areas in Pennsylvania have also been required to achieve US EPA specified minimum percentage reductions in VOC: the seven-county Pittsburgh area and the five-county Philadelphia area. For these areas, projected inventories, both with and without anticipated control strategies, have been prepared for several "milestone" years. Finally, states must develop periodic inventories to "refresh" the 1990 inventory, using updated data and/or estimation methods.

Pennsylvania's inventories generally categorize emissions into four categories:

- highway vehicles
- stationary sources (major industrial, commercial and utility sources)
- area sources (smaller industrial/commercial sources, consumer products)
- nonroad mobile sources (including construction and agricultural equipment, lawn and garden equipment)

Of all of the sources of air pollution, only the emissions of some stationary sources are measured directly and continuously through instrumentation. Emissions from all other sources must be estimated in some fashion, including those from highway vehicles. In their very simplest form, estimates of emissions follow the following pattern:

Emission rate x activity level = emissions per time period (usually day or year)

Most emission rates have been developed by EPA, in cooperation with industry and states, over many years and are compiled and documented in a reference volume, Compilation of Air Pollution Emission Factors (AP-42).

For example, the annual VOC emissions from residential fuel oil heating could be estimated by:

AP-42 emission rate	*x*	*activity level* =	*emissions*
0.713 pounds/gallon	*x*	# dwelling units *x* % using oil *x* # gallons per unit	# pounds of VOC per year

Adding up the products of the emission rates and activity levels for all sources of a given pollutant constitutes the emission inventory for that pollutant.

Highway Vehicle Emission Inventories

Highway vehicles contribute significantly to air pollution, particularly to ground-level ozone, which is the most persistent air pollutant in Pennsylvania. Ozone is not created directly but formed in sunlight from VOCs and NOx. Both VOCs and NOx are emitted from highway vehicles. Pennsylvania's ozone-related emission inventory efforts have been focused on these pollutants.

Obviously, direct measurement of emission levels from all vehicles in use is impossible. In comparison to highway vehicles, estimating residential heating emissions is a fairly simple calculation because there is a constant emission rate and a fairly simple measure of activity. For highway vehicles, however, estimating the emission rate and activity levels of all vehicles on the road during a typical summer day is a complicated endeavor.

If every vehicle emitted the same amount of pollution all the time, one could simply multiply those emission standards (emission rate in grams of pollution per mile) times the number of miles driven (activity level) to estimate total emissions. But, the fact is that emission rates from all vehicles vary over the entire range of conditions under which they operate. These variables include air temperature, speed, traffic conditions, operating mode (started cold? started warm? running already warmed up?) and fuel. The inventory must also account for non-exhaust or evaporative emissions. In addition, the fleet is composed of several generations, types of vehicles and their emission control technologies, each of which performs differently. This requires that the composition of the fleet (vehicle ages and types) must also be included in the estimation algorithm.

In order to estimate both the rate at which emissions are being generated and to calculate vehicle miles traveled (activity level), Pennsylvania examines its road network and fleet to estimate vehicles activity. For ozone-related inventories, this is done for a typical summer (July) weekday. Not only must this be done for a baseline year, but it must also be projected into the future. This process involves a large quantity of data and is extremely complex.

Computer models have been developed to perform these calculations by simulating the travel of vehicles on the Commonwealth's roadway system. These models then generate emission rates (also called emission factors) for different vehicle types for area-specific conditions and then combine them in summary form. The "area-specific conditions" include vehicle and highway data, plus control measure characteristics and future year projections of all variables.

MOBILE. The heart of the highway vehicle emission calculation procedure is EPA's highway vehicle emission factor model, MOBILE. This is a FORTRAN program that calculates **average** in-use fleet emission factors for ozone precursors for each of eight categories of vehicles under various conditions affecting in-use emission levels (e.g., ambient temperatures, average traffic speeds, gasoline volatility) as specified by the model user. MOBILE produces the "emission rates" referred to in the previous section.

The model was first developed as MOBILE1 in the late 1970s, and has been periodically updated to reflect the collection and analysis of additional emission factor data over the years, as well as changes in vehicle, engine and emission control system technologies, changes in applicable regulations, emission standards and test procedures, and improved understanding of in-use emission levels and the factors that influence them. Pennsylvania is currently using MOBILE5b as approved by EPA.

PPAQ. Pennsylvania also uses the Post Processor for Air Quality (PPAQ), which consists of a set of programs that perform the following functions:

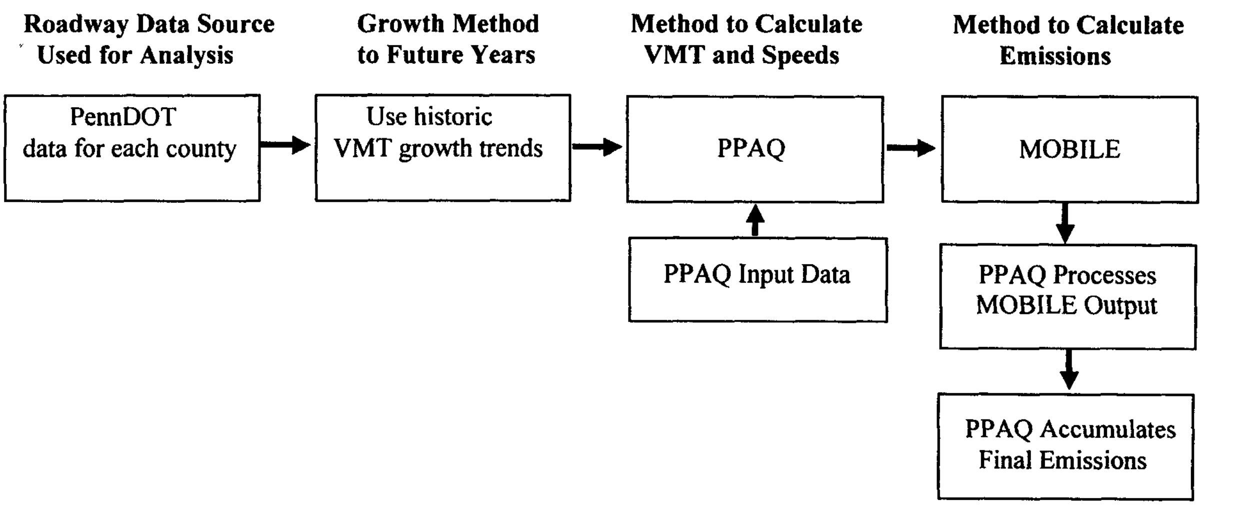
- Analyzes highway operating conditions
- Calculates highway speeds
- Compiles vehicle miles of travel (VMT) and vehicle type mix data
- Prepares MOBILE runs
- Calculates emission quantities from output MOBILE emission rates and accumulated highway VMT.

PPAQ has become a widely used and accepted tool for estimating speeds and processing MOBILE emission rates. It is currently being used for the New York City region, for the north and south New Jersey regions, and in other states including Louisiana, Virginia, and Indiana. The software is based upon accepted transportation engineering methodologies. For example, PPAQ utilizes speed and delay estimation procedures based on planning methods provided in the 1994 Highway Capacity Manual, a report prepared by the Transportation Research Board (TRB) summarizing current knowledge and analysis techniques for capacity and level-of-service analyses of the transportation system.

These two computer programs interact as shown in Exhibit 1.

Exhibit 1

Emission Calculation Process for Pennsylvania



WHERE DOES PENNSYLVANIA OBTAIN ITS DATA?

Data Used in MOBILE

Two major types of information are written into the MOBILE model by EPA: basic emission rates and travel weighting rates. EPA's Office of Mobile Sources obtains this information from a number of sources, including its new vehicle certification program, in-use vehicle random sample studies and special studies (including information from some state I/M programs). For more information on MOBILE, a users guide and various documents (as well as the model itself) are available through EPA's website (http://www.epa.gov/OMSWWW/models.htm).

Basic emission rates are those which are produced under very standardized conditions. The model then modifies (corrects and/or weights) these rates based on other model or input parameters. Rates are incorporated for model year and vehicle type. MOBILE also calculates an assumed amount of increase in emissions as vehicles accumulate mileage.

In addition to exhaust emissions, evaporative VOC emission sources from gasoline-powered vehicles are also included[1]:

- diurnal emissions (evaporated gasoline emissions generated by the rise in temperature over the course of a day when the vehicle is not being driven),
- hot soak emissions (evaporated gasoline emissions occurring after the end of a vehicle trip, due to the heating of the fuel, fuel lines, fuel vapors),
- running loss emissions (evaporated gasoline emissions occurring while a vehicle is driven, due to the heating of the fuel and fuel lines),
- resting loss emissions (small but continuous seepage and minor leakage of gasoline vapor through faulty connections, permeable hoses and other materials in the fuel system).

Evaporative emissions are very dependent on temperature and fuel volatility as well as vehicle model year.

Travel Weighting Fractions. Research has found that newer cars tend to be driven more. The model reflects this, using state-specific vehicle age distributions from registration data. The model also contains assumptions about trips per day and miles per day by age of the vehicle. This is important for exhaust emissions because these emissions are greater when the vehicle is not warmed up (cold start). Also, this information helps characterize evaporative emissions.

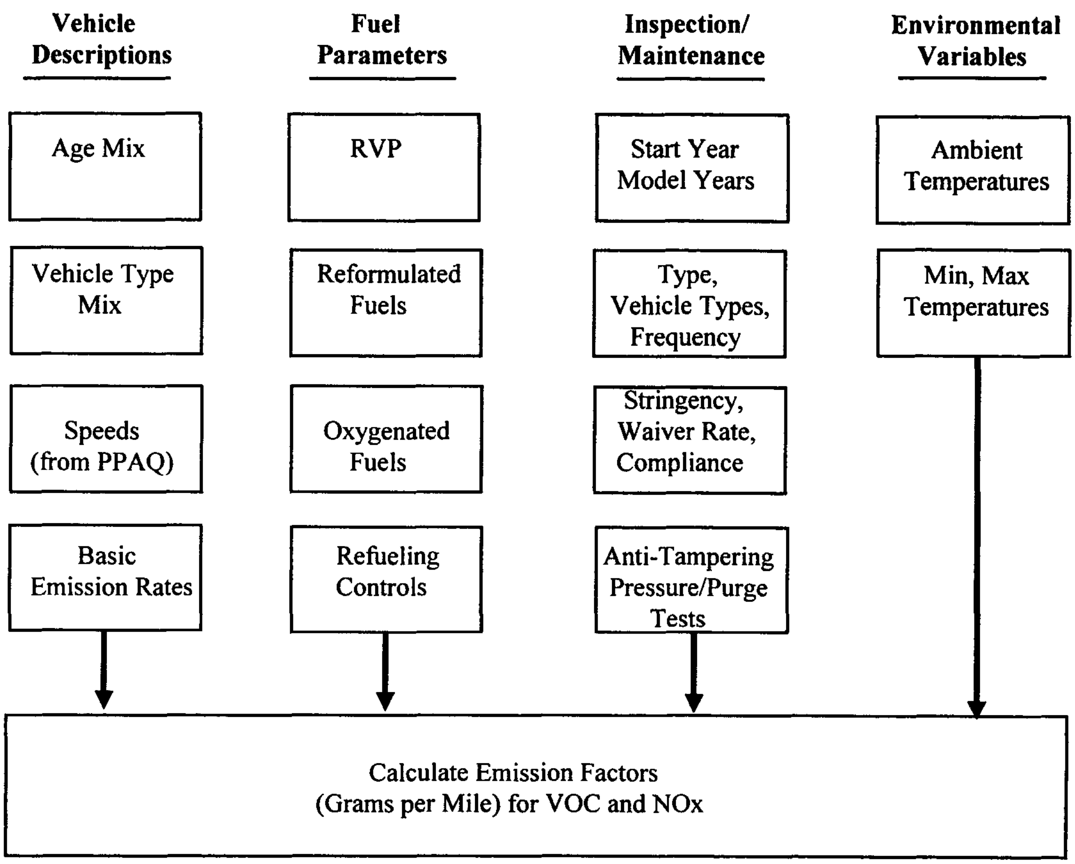
[1] Some states use MOBILE to estimate refueling emissions (gasoline vapor emissions generated by the refueling of vehicles, where in the absence of controls the vapor in the vehicle fuel tank is displaced by the incoming liquid fuel and released to the atmosphere). Pennsylvania includes these emissions in the area source inventory.

What Are The Necessary Data Inputs to MOBILE?

A large number of inputs to MOBILE are needed to fully account for the numerous vehicle and environmental parameters that affect emissions including traffic flow characteristics (as determined from the PPAQ software), vehicle descriptions, fuel parameters, inspection/maintenance program parameters, and environmental variables as shown in Exhibit 2. With some input parameters, MOBILE allows the user to choose default values, while others require area-specific inputs.

Exhibit 2

MOBILE Inputs



For an emissions inventory, area specific inputs are used for all of the inputs shown in Exhibit 2 except for the basic emission rates, which are MOBILE defaults. In addition, Pennsylvania uses MOBILE default cold and hot start fractions (20.6 and 27.3 percent). A vehicle will generate more emissions when it is first operated (cold start). It generates emissions at a different rate when it is stopped and then started again within a short period of time (hot start). Cold/hot start fractions reflect what percent of the VMT was accrued after a cold start and after a hot start.

Vehicle Descriptions. Vehicle age distributions are input to MOBILE for each county based on registered vehicles reflecting July 1 summer conditions. These distributions are obtained from PennDOT's Bureau of Motor Vehicle Registration Database. Vehicle Type Mix is calculated by PPAQ from algorithms using a combination of MOBILE default percentages and PennDOT truck percentages from roadway data. (See also the discussion of Vehicle Type Pattern Data in the next section.) Speeds are discussed extensively in the next section.

Fuel Parameters. The same vehicle will produce different emissions using a different type of gasoline. Fuel control strategies can be powerful emission reduction mechanisms. An important variable in fuels for VOC emissions is its evaporability, measured by Reid Vapor Pressure.

MOBILE allows the user to choose among conventional (used in most of Pennsylvania), federal reformulated (now used in the Philadelphia area), oxygenated (not used in Pennsylvania) and low Reid Vapor Pressure (RVP) gasolines (used in the Pittsburgh area starting in 1998). Pennsylvania chooses the MOBILE inputs appropriate to the year and control strategy for the area being modeled.

MOBILE also allows users to calculate refueling emissions -- the emissions created when vehicles are refueled at service stations. Pennsylvania includes refueling emissions in its area source inventory and not in its highway vehicle inventory. However, that calculation uses a grams per gallon emission rate generated by MOBILE.

Vehicle Emission Inspection/Maintenance (I/M) Parameters. MOBILE allows users to vary inputs depending on the I/M program in place for the area or, of course, choose "no I/M program." The inputs include:

- program start year
- stringency level (failure rate) and pass/fail standards or "cutpoints"
- first and last model years subject to the program
- waiver rates
- compliance rates
- program type (test-only, test-and-repair, etc.)
- frequency of inspection (annual, biennial)
- vehicle type coverage
- test type (idle, loaded, etc.)
- technician training program

Some cutpoints (the emissions at which vehicles are failed) are contained in MOBILE, while others must be put in by the model user. Pennsylvania uses the parameters specific for the geographic area and year for which the modeling is being performed.

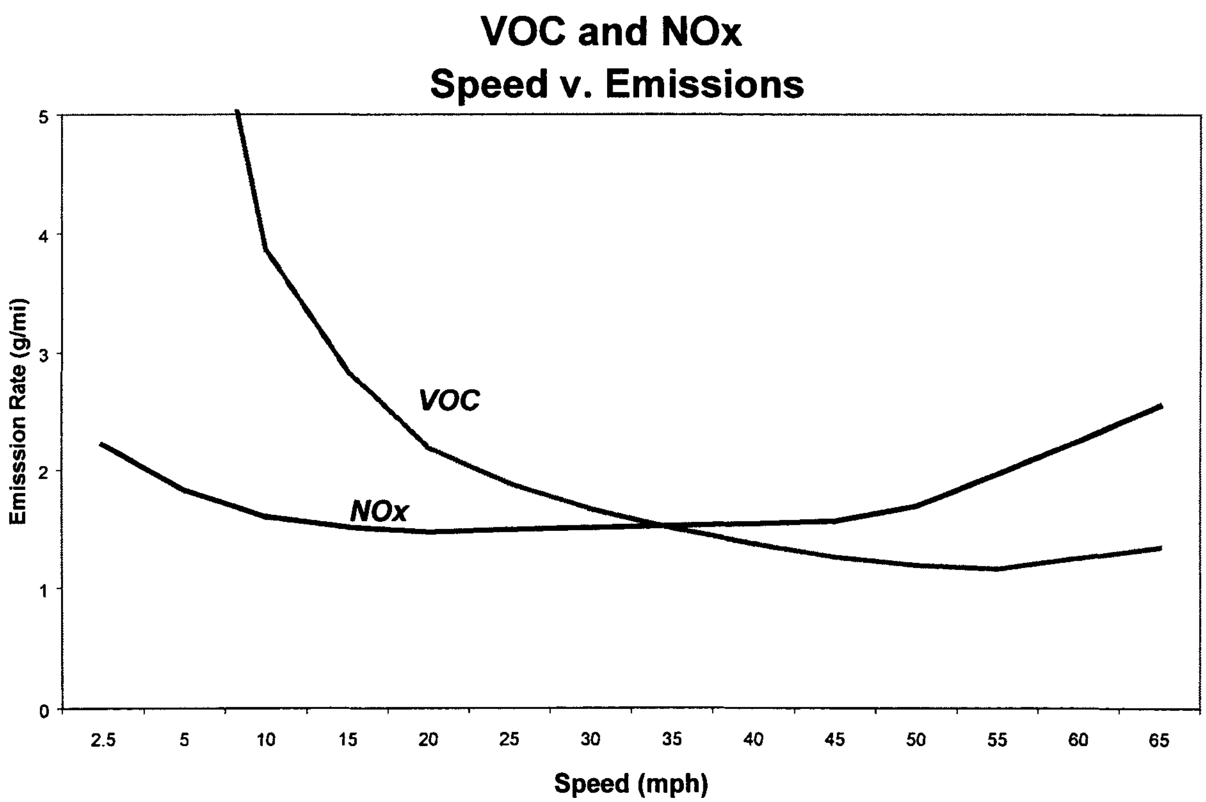
Environmental Variables. Evaporative emissions are influenced significantly by the temperatures of the surrounding air. Minimum, Maximum, and Ambient temperatures have been compiled for each county based on information from EPA's CHIEF bulletin board reflecting airport temperatures on emission violation days.

Emission and Speed Relationships

Of all the user-supplied input parameters, perhaps the most important is vehicle speed. Emissions of both VOC and NOx vary significantly with speed, but the relationships are not linear, as shown in Exhibit 3. While VOCs generally decrease as speed increases, NOx decreases only at the low speed range and increases steeply at higher speeds.

To obtain the best estimate of vehicle speeds, Pennsylvania uses the PPAQ set of programs, whose primary function is to calculate speeds and to organize and simplify the handling of large amounts of data needed for calculating speeds and for preparing MOBILE input files.

Exhibit 3



PPAQ can also provide a link between transportation and air quality models, enabling models like MOBILE to take advantage of the wealth of information generated by transportation models in a form which is relevant for air quality. Transportation models are presently used in the Philadelphia and Pittsburgh areas and are being incorporated into the transportation planning process in other metropolitan areas in the Commonwealth.

Roadway Data

The roadway data input to emissions calculations for Pennsylvania uses information from the Roadway Management System (RMS) maintained by PennDOT's Bureau of Planning and Research. PennDOT obtains this information from periodic visual and electronic traffic counts. RMS data is dynamic since it is continually reviewed and updated from new traffic counts and field visits conducted by PennDOT. Information on roadways included in the National Highway System is reviewed at least annually, while information on other roadways is reviewed at least biennially.

Periodically, a current "snapshot" of the RMS database is taken and downloaded to provide an up-to-date record of the Commonwealth's highway system for estimating emissions.

The RMS database contains all state highways, including the Pennsylvania Turnpike, divided into segments approximately 0.5 miles in length. These segments are usually divided at important intersections or locations where there is a change in the physical characteristics of the roadway (e.g. the number of lane changes). There are approximately 99,000 state highway segments for the 67 Pennsylvania counties contained in the RMS. Each of these segments contains an abundance of descriptive data, but only the following information is extracted for emission calculations:

- Lanes
- Distances
- Volumes in Average Annual Daily Traffic (AADT)
- Truck percentages
- PennDOT urban/rural classifications
- PennDOT functional class codes

RMS volumes and distances are used in calculating highway VMT totals for each county. As discussed in the next section, adjustments are needed to convert the volumes to an average July weekday. Lane values are an important input for determining the congestion and speeds for individual highway segments. Truck percentages are used in the speed determination process and are used to split volumes to individual vehicle types used by the MOBILE software.

Pennsylvania classifies its road segments by function, as well as whether it is located in an urban, small urban or rural area, as indicated below in Exhibit 4. The PennDOT urban/rural (UR) and functional classes (FC) are important indicators of the type and function of each roadway segment. The variables provide insights into other characteristics not contained in the RMS data that are used for speed and emission calculations. In addition, VMT and emission quantities are aggregated and reported using both UR and FC codes.

Exhibit 4

PennDOT Classification Scheme: Urban/Rural Codes and Functional Class Codes

Urban/Rural Code	1=Rural 2=Small Urban 3=Urban	
Functional Class	Rural Functional Classes Used For Rural Areas	Urban Functional Classes Used For Small Urban and Urban Areas
	1=Rural Freeway	11=Urban Freeway
	2=Rural Other Principal Arterial	12=Urban Expressway
	6=Rural Minor Arterial	14=Urban Principal Arterial
	7=Rural Major Collector	16=Urban Minor Arterial
	8=Rural Minor Collector	17=Urban Collector
	9=Rural Local	19=Urban Local

Note: Functional Classes 3,4,5,10,13,15,18 are not currently used in PennDOT's RMS database

Additions and Adjustments to Roadway Data

Before the RMS data can be used by PPAQ for speed and emission calculations, several adjustments and additions must be made to the roadway data.

1990 HPMS Adjustments: According to EPA guidance, baseline inventory VMT computed from the RMS highway segment volumes must be adjusted to be consistent with Highway Performance Monitoring System (HPMS) VMT totals. The HPMS VMT reported for Pennsylvania is a subsystem of the RMS established to meet the data reporting requirements of the Federal Highway Administration (FHWA) and to serve as PennDOT's official source of highway information. Although it has some limitations, the HPMS system is currently in use in all 50 states and is being improved under FHWA direction.

The HPMS VMT totals are developed from the data contained in the RMS database at the time of reporting and serves as a "snapshot" of the RMS data for a particular year. Since the RMS database does not contain many local roads, a separate procedure is used by PennDOT to estimate total local VMT for the HPMS system. HPMS VMT summaries are prepared each year and reported by PennDOT urban/rural and functional class codes. The VMT contained in the HPMS reports are considered to represent average annual daily traffic (AADT).

Although the HPMS VMT and the roadway data used for an inventory emissions analysis are both based on data from the RMS system, differences do exist between them and include the following. First, the HPMS and inventory roadway data are "snapshots" of the RMS data taken at different times. Since the RMS is dynamic, changing constantly due to new data, differences will result between the data used for calculating HPMS VMT totals and the inventory data used for an emissions analysis. Second, local estimates of HPMS VMT are obtained through alternative procedures developed by PennDOT. However, the emissions inventory makes use of those few local roads contained in the RMS system. To account for such differences, adjustment factors are calculated and used to adjust the inventory roadway data to the reported HPMS VMT totals submitted to FHWA.

Adjustment factors are calculated which adjust the 1990 RMS VMT to be consistent with 1990 HPMS totals. These factors are developed for each county, urban/rural code, and functional class combination and are also applied to all future year runs. Adjustments for the "higher" functional classes (e.g. Freeway, Arterials - major routes) were very close to 1.000 since HPMS VMT is derived from RMS information, and the only difference in the data is that the "snapshot" for the emission calculations is taken at a different time than for the HPMS. "Lower" classes (e.g. local roads) require greater adjustment since a large part of the local system is not under state jurisdiction and is not in the RMS database. There is, of course, a significant amount of local road mileage in the state. It is assumed that those local streets that are in RMS are representative of all local streets in their area with respect to volume and speed, so that roadway mileage adjustment is appropriate.

The adjustment factors calculated above are applied by PPAQ during each run. The factors developed for the 1990 volumes are also used for any future year runs.

Seasonal Adjustments to Volumes: The RMS contains AADT volumes that are an average of all days in the year including weekends and holidays. An ozone emission analysis, however, is based on a typical July weekday. Therefore, those volumes must be seasonally adjusted. Seasonal factors were developed for each functional class and urban/rural code based on yearly count information prepared by PennDOT's Bureau of Planning and Research. These factors are applied to the existing RMS AADT volumes to produce the July volumes.

Additional Network Information: The PPAQ software system allows for many additional variables other than those available in the RMS database. Using these variables improves the ability of Pennsylvania to incorporate real roadway conditions into its estimates. The variables include information regarding signal characteristics and other physical roadway features that can affect a roadway's calculated congested speed. PPAQ's ability to estimate congested speeds by road segment improves Pennsylvania's emissions inventories because of the overwhelming role speed plays in emission rates. If specific information regarding these variables is known or obtained for areas, this information can be appended to the RMS database. Otherwise, default values are assumed based on information provided by the PPAQ input speed/capacity lookup data as described below.

Speed/capacity lookup data provides PPAQ with initial (free-flow with no congestion) speeds and capacities for different urban/rural code and functional class groupings. The initial speeds and capacities are used by PPAQ in determining the final congested speed for each roadway segment. Speeds can also be greatly impacted by signals and other roadway features. As a result, this data provides default signal densities (average number of signals per mile for different functional classes) as well as default values for variables that determine the decay of speed with varying levels of congestion. As discussed above, values from the speed/capacity data can be overridden for specific links by directly coding values to the roadway database segments. The speed capacity data was developed from a combination of sources including the following:

- Information contained in the 1994 Highway Capacity Manual
- PennDOT information on speeds and signal densities
- Engineering judgment

24-hour Pattern Data: Speeds and emissions vary considerably depending on the time of day (because of temperature) and congestion. Therefore, it is important to estimate the pattern by which roadway volume varies by hour of the day. The 24-hour pattern data provides PPAQ with information used to split the daily roadway segment volumes to each of the 24 hours in a day. Pattern data is in the form of a percentage of the daily volumes for each hour. Distributions are provided for each county and functional class grouping. This data was developed from 24-hour count data compiled by PennDOT's Bureau of Planning and Research, according to the process in Procedures for Adjusting Traffic Count Data, 1991.

Vehicle Type Pattern Data: Basic emission rates may differ by vehicle type. These types are listed below in Exhibit 5.

Exhibit 5

MOBILE Vehicle Types

1.	LDGV	- Light-Duty Gasoline Vehicles
2.	LDGT1	- Light-Duty Gasoline Trucks (<6,500 lbs)
3.	LDGT2	- Light-Duty Gasoline Trucks (<8,500 lbs)
4.	HDGV	- Heavy-Duty Gasoline Vehicles (>8,500 lbs)
5.	LDDV	- Light-Duty Diesel Trucks (<8,500 lbs)
6.	LDDT	- Light-Duty Diesel Trucks (<8,500 lbs)
7.	HDDV	- Heavy-Duty Diesel Vehicles (>8,500 lbs)
8.	MC	- Motorcycles

MOBILE summary reports by vehicle type are also useful in knowing what kinds of vehicles generate emissions. The vehicle type pattern data is used by PPAQ to divide the hourly roadway segment volumes to the eight MOBILE vehicle types. Similar to the 24-hour pattern data, this data contains percentage splits to each vehicle type for every hour of the day. The vehicle type pattern data was developed from several sources of information:

- Hourly distributions for trucks and total traffic compiled by PennDOT's Bureau of Planning and Research, according to Procedures for Adjusting Traffic Counts, 1991
- PennDOT truck percentages from the RMS database
- MOBILE default vehicle type breakdowns

The vehicle type pattern data is developed for each county and functional class combination. First, RMS truck percentages are averaged for all roadways within a county, functional class grouping. Using this percentage data, the total roadway volume for any segment could be divided to both auto and truck vehicle type categories. However, these percentages do not yet enable volumes to be divided to each of the eight MOBILE vehicle types. As a result, MOBILE default vehicle type breakdowns are then used to divide the auto and truck percentages, calculated above, to each specific MOBILE vehicle type. PennDOT hourly distributions for trucks and total traffic are then used to create vehicle type percentage breakdowns for each hour of the day.

Vehicle Type Capacity Analysis Factors: Vehicle type percentages are provided to the capacity analysis section of PPAQ to adjust the speeds in response to trucks. That is, a given number of larger trucks take up more roadway space than a given number of cars, and this must be accounted for in the model. Capacity is adjusted based on the factors provided in this data. Values are developed from information in the 1994 Highway Capacity Manual and are specific to the various facility types.

Producing Future Year Volumes

Growth factors are used to project future highway volumes from the volumes provided in the RMS database. Separate factors are derived for each county and highway functional class from an analysis of historic HPMS growth trends, coupled with estimates of population and employment growth from the U.S. Department of Commerce's Bureau of Economic Analysis (BEA). The factors are then applied to base year traffic volumes on each highway segment in the RMS network database.

The Pittsburgh and Philadelphia regions, however, use a different approach for determining future year volumes, since the larger metropolitan areas are required to use more sophisticated projection methods for transportation planning. These areas currently have traffic forecasting models in place as required by US Department of Transportation; VMT estimates for base and future years are obtained from the model runs. From these VMT estimates, growth factors are prepared which are then applied to the RMS database volumes similar to other regions in Pennsylvania.

SPEED/EMISSION ESTIMATION PROCEDURE

The previous sections have summarized the input data used for computing speeds and emission rates for Pennsylvania. This section explains how PPAQ and MOBILE use that input data to produce emission estimates. Exhibit 6 on the following page summarizes PPAQ's analysis procedure used for each of the 99,000 highway segments in the state.

Producing an emissions inventory with PPAQ requires a process of disaggregation and aggregation. Data is available and used on a very small scale -- individual ½ mile roadway segments 24 hours of the day. This data needs to first be aggregated into categories so that a reasonable number of MOBILE scenarios can be run, and then further aggregated and/or re-sorted into summary information that is useful for emission inventory reporting.

Volume/VMT Development

Before speeds can be calculated and MOBILE run, volumes acquired from RMS must be adjusted and disaggregated. Such adjustments include factoring to future years, seasonal adjustments, and disaggregating daily volumes to each hour of the day and to each of the eight MOBILE vehicle types.

Future Year Volumes: The RMS database contains up-to-date current year volumes. However, to conduct a future year analysis, these volumes must be factored to the year being analyzed. Growth factors have been prepared based on historic HPMS trends coupled with population and employment forecasts for each county, urban/rural area code, and functional class grouping. These growth factors are applied to the base year RMS volumes to obtain future year estimates that can be utilized by PPAQ.

Example:

A typical freeway link in the RMS database is I-80 segment 2500 in Luzerne County, Pennsylvania. This link has an urban/rural code=1 which indicates the link is in a rural area, and a functional class=1 indicating a rural freeway. The average annual daily traffic (AADT) from the RMS database for this link in 1990 is 12,077 vehicles/day.

Growth factors have been developed to factor the 1990 volume to future years. For example, to factor the 1990 volume to the year 2002, a factor of 1.282 has been developed for Luzerne County rural freeways.

2002 volume = 12,077 vehicles/day x 1.282 = 15,483 vehicles/day

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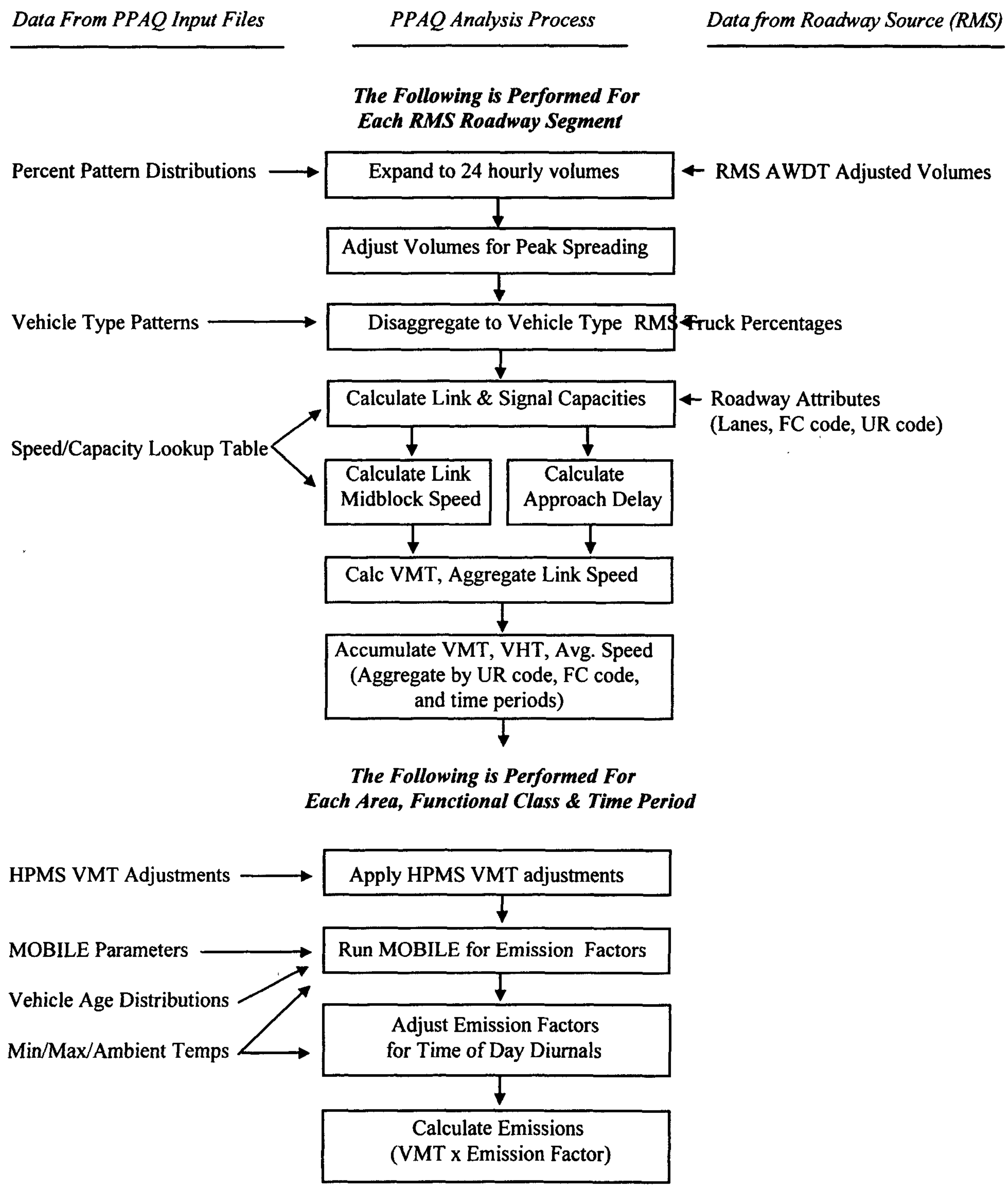
Exhibit 6

PPAQ Speed/Emission Estimation Procedure



Seasonal Adjustments: PPAQ takes the input daily volumes from RMS which represent AADT and seasonally adjusts the volumes to an average weekday in July. This adjustment utilizes factors developed for each functional class and urban/rural code. VMT can then be calculated for each link using the adjusted weekday volumes.

Example:

Again, assume the rural freeway link: I-80 segment 2500 in Luzerne County, Pennsylvania. The average annual daily traffic (AADT) for this link in 1990 is 12,077 vehicles/day.

Seasonal factors have been developed for urban/rural code and functional class combinations. For an urban/rural code=1 and a functional class=1, the factor to convert from AADT to an average weekday in July is = 1.15

Average Weekday July Volume = 12,077 x 1.15 = 13,889 vehicles/day

Total VMT (daily) for this link is calculated as volume x distance. The distance of this link as obtained from RMS is 0.286 miles.

1990 VMT = 13,889 vehicles/day x 0.296 miles = 41,111 vehicle-miles / day

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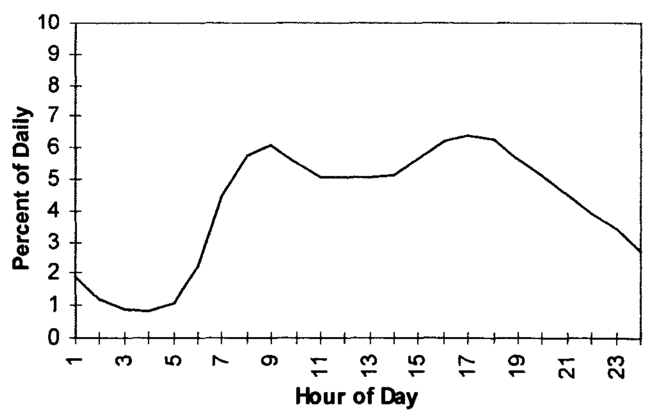
Disaggregation to 24 Hours: After seasonally adjusting the link volume, the volume is split to each hour of the day. This allows for more accurate speed calculations (effects of congested hours) and allows PPAQ to aggregate VMT and speeds to different time periods for purposes of running MOBILE scenarios and reporting emissions.

Example:

To support speed calculations and emission estimates by time of day, the July weekday volume is disaggregated to 24 hourly volumes. Temporal patterns were previously developed from PennDOT count data and input to PPAQ. For the I-80 rural freeway link with morning peak volumes similar to evening peak hours (neutral), the following temporal pattern is applied:



Using the I-80 segment for 1990, typical hourly volumes which result include:

8-9 a.m.	6.0% x (41,111 vehicle miles/ 0.296mi.) = 833 vehicles/hour (vph)	
12-1 p.m.	5.0% x (41,111 vehicle .miles/ 0.296mi.) = 694 vph	
5-6 p.m.	6.3% x (41,111 vehicle miles/ 0.296mi.) = 875 vph	

After dividing the daily volumes to each hour of the day, PPAQ identifies hours that are overly congested. For those hours, PPAQ then spreads a portion of the volume to other hours within the same peak period, thereby approximating the "peak spreading" that normally occurs in such over-capacity conditions.

Disaggregation to Vehicle Type: EPA requires VMT estimates to be prepared by vehicle type, reflecting specific local characteristics. As a result, for Pennsylvania's emission inventory, the hourly volumes are disaggregated to the eight MOBILE vehicle types based on count data assembled by PennDOT.

Example:

Disaggregation of the total I-80 volume (by hour) to the various vehicle types would include the following:

Total Volume 8-9 am = 833 vph

Vehicle Type Volume 8-9 am:

LDGV	54.1%	451 vph
LDGT1	19.7%	164 vph
LDGT2	13.8%	115 vph
HDGT	2.7%	22 vph
LDDV	2.3%	19 vph
LDDT	1.8%	15 vph
HDDV	4.8%	40 vph
MC	0.8%	7 vph

Speed/Delay Determination

EPA recognizes that the estimation of vehicle speeds is a difficult and complex process. Because emissions are so sensitive to speeds, it recommends special attention be given to developing reasonable and consistent speed estimates; it also recommends that VMT be disaggregated into subsets that have roughly equal speed, with separate emission factors for each subset. At a minimum, speeds should be estimated separately by roadway functional class. The computational framework used for this analysis meets and exceeds that recommendation: Speeds are individually calculated for each roadway segment and hour and incorporate the delays encountered at signals. VMT and vehicle hours of travel (VHT) are then accumulated for each cell of the county/functional class/time of day matrix; accumulated VMT is divided by VHT to produce the cell's average speed.

To calculate speeds, PPAQ first obtains initial capacities (how much volume the roadway can serve before heavy congestion) and free-flow speeds (speeds assuming no congestion) from the speed/capacity lookup data. As described in previous sections, this data contains default roadway information indexed by the urban/rural code and functional class. For areas with known characteristics, values can be directly coded to the RMS database and the speed/capacity data can be overridden. However, for most areas where known information is not available, the speed/capacity lookups provide valuable default information regarding speeds, capacities, signal densities and characteristics, and other capacity adjustment information used for calculating congested delays and speeds.

Example:

The speed/capacity lookup table is used to obtain important data used for link speed calculations. For the I-80 link with an urban/rural code = 1 (rural) and a functional class = 1 (freeway), the lookup table provides information including the following:

freeflow speed = 65 mph
capacity = 1800 vph per lane
number of signals = 0

This information is used along with the physical characteristics of the roadway to calculate the delay (including congestion) to travel this link during each hour of the day:

For example: The I-80 link is calculated to have a travel time, including delay of 17.76 seconds for the 8-9am hour

Total travel time, in vehicle hours, for the 8-9am hour is calculated as:

VHT (8-9am) = 17.76 seconds x 833vph / 3600 sec/hr = 4.12 vehicle hours

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The result of this process is an estimated average travel time for each hour of the day for each highway segment. The average time can be multiplied by the volume to produce vehicle hours of travel (VHT).

HPMS and VMT Adjustments

Volumes must also be adjusted to account for differences with the HPMS VMT totals, as described previously. VMT adjustment factors are provided as input to PPAQ, and are applied to each of the roadway segment volumes. These factors were developed from 1990 data; however, they are also applied to any future year runs. The VMT added or subtracted to the RMS database assumes the speeds calculated using the original volumes for each roadway segment for each hour of the day.

Example:

Using the Luzerne County I-80 rural freeway link example, the daily assigned volume is adjusted to account for reconciliation with the HPMS VMT. RMS VMT (in AADT) for Luzerne County rural freeways totals 962,559 vehicle miles in 1990. HPMS VMT (in AADT) as supplied by PennDOT and reported to FHWA totals to 990,088 vehicle miles for the rural freeways. A factor is developed by dividing the HPMS VMT by the RMS VMT:

HPMS adjustment factor for Luzerne County rural freeways = 990,088 / 962,559 = 1.029

This factor is held constant in all future years. As an example, this adjustment is made to the I-80 freeway link VMT for the 8-9am hour after speed calculations are made, and produces the final July weekday VMT for this hour used for Ozone runs.

I-80 Link VMT (8-9am) = 833vph x 0.296 miles x 1.029 = 254 vehicle miles

VMT and Speed Aggregation

While highway volumes, vehicle mixes, and speeds are calculated on the basis of individual highway segments and hours, this data is far too disaggregate to apply directly to MOBILE. Therefore, PPAQ has been set up to automatically accumulate VMT and VHT by larger geographic areas, highway functional class, and time periods as shown in Exhibit 7.

Exhibit 7

VMT/VHT Aggregation Scheme

County			67 entries
Urban/Rural Code	1=Rural 2=Small Urban 3=Urban		18 entries
Functional Class	1=Rural Freeway 2=Rural Other Principal Arterial 6=Rural Minor Arterial 7=Rural Major Collector 8=Rural Minor Collector 9=Rural Local	11=Urban Freeway 12=Urban Expressway 14=Urban Principal Arterial 16=Urban Minor Arterial 17=Urban Collector 19=Urban Local	
Time Periods	AM Peak Period (7:00 to 10:00 AM) Midday (10:00 AM to 4:00 PM) PM Peak Period (4:00 to 6:00 PM) Night (6:00 PM to 7:00 AM)		4 entries
			4,824 potential combinations

Geographic aggregation is performed by urban, small urban, and rural areas of each county. Functional class aggregation is according to PennDOT's eighteen standard functional classes, respecting urban, small urban and rural definitions. Time period aggregation is according to AM peak, PM peak, Midday, and Night as defined in Exhibit 6. For an individual county, this creates a potential for 72 possible combinations, each of which becomes an input MOBILE scenario. This allows each MOBILE scenario to represent the actual VMT mix, speed, and potentially cold/hot start fraction for that geographic / highway / time combination. Altogether then, there are potentially 4,824 combinations for which speeds and VMT are computed and emissions are calculated with MOBILE.

Once all links are processed and VMT and VHT accumulated, average speeds are calculated for each cell of the accumulation matrix by dividing VMT by VHT. This speed is then input to the MOBILE scenario as the average speed for that cell.

Example:

The hourly VMT and VHT quantities are accumulated into a matrix of VMT and VHT for each combination of county, urban/rural code, functional class, and time period.

For this example, Luzerne County rural freeways during the morning peak period (7-10am) will carry 155,904 vehicle miles of travel, and will involve 2,399 vehicle hours of travel. Dividing the accumulative VMT by the cumulative VHT produces the average operating speed for this cell:

Average speed = VMT / VHT = 155,904 / 2,399 = 64.9 mph

Thus the Luzerne County rural freeways will operate at an average speed of 65.0 mph during the morning peak period. Overall, on a 24-hour basis the total VMT for Luzerne rural freeways will be 1,148,251 vehicle miles, and the average travel speed will be 65.0 miles per hour.

MOBILE Emissions Run

After computing speeds and aggregating VMT and VHT, PPAQ prepares input files to be run in EPA's MOBILE program which is used to produce VOC and NOx emission factors in grams of pollutant per vehicle mile. The process uses an unmodified version of the MOBILE program that was obtained directly from EPA.

The MOBILE input file prepared by PPAQ contains the following:

- MOBILE template containing appropriate parameters and program flags
- Temperature data specific to the county being run
- Vehicle age data for the county being run
- Scenario data - contains VMT mix, average speeds specific to scenario as produced by PPAQ

Example:

A MOBILE input file is created by PPAQ for Luzerne County. This file contains separate scenarios for each urban/rural code, functional class, and time period combination. A scenario represents a separate MOBILE run with different emission factors calculated and output for each run.

For this example, Luzerne County rural freeways during the morning peak period (7-10am) will be run as a scenario. Specific data including temperature data, vehicle mix data, and speeds are supplied by PPAQ for this morning period scenario.

Time of Day and Diurnal Emissions

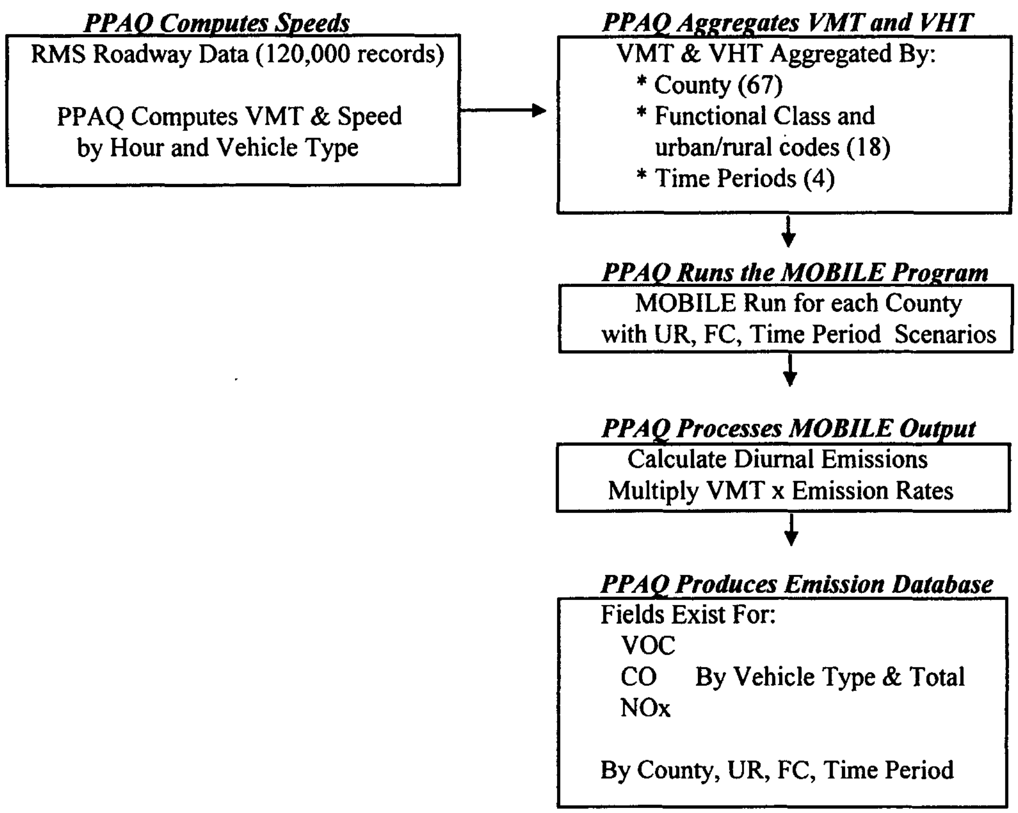
The highway system VMT and speeds are aggregated according to four time periods. Because diurnal emissions are calculated by MOBILE on the basis of 24-hour minimum-to-maximum temperatures, special processing is needed to accurately estimate the emissions component by allocating daily diurnal emissions to the various time periods. This is done within the computational process by adjusting the emission factors for each time period to correctly account for that time period's share of the daily diurnal emissions.

Process MOBILE Output

After MOBILE has been run, PPAQ processes the MOBILE output files and compiles the emission factors for each scenario. Using the above methodology, it allocates daily diurnal emissions to each of the time periods. Using the MOBILE emission factors, PPAQ calculates emission quantities by multiplying the emission factors by the aggregated VMT totals. PPAQ then produces an emissions database summarizing VMT, VHT, VOC, and NOx emissions as shown in Exhibit 8.

Exhibit 8

Summary of PPAQ's Methodology in Producing Emissions Summary



Example:

Luzerne County rural freeways during the morning peak period (7-10am) were run as a scenario in MOBILE. Based on the input information, MOBILE outputs emission factors by vehicle type for this scenario as shown below:

Composite Emission Factors (grams/mile) from MOBILE output

Vehicle Type:	LDGV	LDGT1	LDGT2	HDGT	LDDV	LDDT	HDDV	MC
VOC:	1.22	1.86	2.42	3.68	0.36	0.54	1.13	4.53
NOX:	2.41	3.16	3.66	7.14	1.84	4.15	5.84	8.71

PPAQ reads these emission factors from the MOBILE output file and multiplies them by the Luzerne County morning peak period rural freeway VMT to obtain emission totals for this scenario. (Note: emissions shown in kg/day which is converted to tons/day in SIP narratives)

PPAQ computes emissions as follows for this scenario:

			Emission Factors (g/mi)			**Emissions (kg/day)**	
Veh Type	**VMT**		**VOC**	**NOX**		**VOC**	**NOX**
LDGV	84,344	x	1.22	2.41	=	102.9	203.3
LDGT1	30,713	x	1.86	3.16	=	57.1	97.1
LDGT2	21,515	x	2.42	3.66	=	52.1	78.7
HDGT	4,209	x	3.68	7.14	=	15.5	30.1
LDDV	3,586	x	0.36	1.84	=	1.3	6.6
LDDT	2,806	x	0.54	4.15	=	1.5	11.6
HDDV	7,483	x	1.13	5.84	=	8.5	43.7
MC	1,248	x	4.53	8.71	=	5.7	10.9
Total	155,903					244.6	482.0

The emissions for this scenario are reported and stored in an output database file which contains a record for each scenario with fields containing VMT, VHT, VOC emissions, and NOX emissions. Fields exist for each vehicle type and for the total of all vehicle types as shown below.

Reported by Vehicle Type 1-8 and Total --- Repeated for VHT, HC, NOX

Cnty	**UR**	**FC**	**Time**	**VMT1**	**VMT2**	**VMT3**	**VMT4**	**VMT5**	**VMT6**	**VMT7**	**VMT8**	**VMTtot**
Luze	1	1	AM	84,344	30,713	21,515	4,209	3,586	2,806	7,483	1,248	155,903
				VHT1	**VHT2**	**VHT3**	**VHT4**	**VHT5**	**VHT6**	**VHT7**	**VHT8**	**VHTtot**
				1,298	473	331	65	55	43	115	19	2,399
				VOC1	**VOC2**	**VOC3**	**VOC4**	**VOC5**	**VOC6**	**VOC7**	**VOC8**	**VOCtot**
				102.9	57.1	52.1	15.5	1.3	1.5	8.5	5.7	244.6
				NOX1	**NOX2**	**NOX3**	**NOX4**	**NOX5**	**NOX6**	**NOX7**	**NOX8**	**NOXtot**
				203.3	97.1	78.7	30.1	6.6	11.6	43.7	10.9	482.0

RESOURCES

MOBILE model

Modeling Page within EPA's Office of Mobile Sources Website (http://www.epa.gov/otaq/models.htm) contains a downloadable model, MOBILE users guide and other information.

"AP-42" document, "Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources," as updated by Supplement A (January 1991), available in hard-copy only. This material is also in the process of being revised and updated. Contact AP-42 Project, Test and Evaluation Branch, EPA, 2565 Plymouth Road, Ann Arbor, MI 48105.

Highway Vehicle Emission Estimates (June 1992) and *Highway Vehicle Emission Estimates II* (May 1995) discusses how EPA obtains data for MOBILE and some of the shortcomings in earlier models. Similar discussions of the present version's shortcomings are discussed in papers available at the website.

"MOBILE5, Information Sheet #5, Inclusion of New 2004 NOx Standard for Heavy-Duty Diesel Engines in MOBILE5a and MOBILE5b Modeling," US EPA, January 30, 1998.

"MOBILE5, Information Sheet #6, Effects of the New National Low Emission Vehicle Standard for Light-Duty Gasoline Fueled Vehicles," US EPA, July 1998.

"MOBILE5, Information Sheet #7, NOx Benefits of Reformulated Gasoline Using MOBILE5a," US EPA, September 1998.

"MOBILE5, Information Sheet #8, Tier 2 Benefits Using MOBILE5," USEPA, April 2000.

Traffic Engineering

1994 Highway Capacity Manual, Transportation Research Board, presents current knowledge and techniques for analyzing the transportation system.

Procedures for Adjusting Traffic Count Data, 1991 edition, Pennsylvania Department of Transportation, Bureau of Planning and Research

Traffic Data Collection and Factor Development Report, 1996 Data, Pennsylvania Department of Transportation, Bureau of Planning and Research.

Highway Vehicle Inventory Glossary

AADT: Average Annual Daily Traffic, average of ALL days.

AWDT: Average Weekday Daily Traffic

Basic emission rates: MOBILE emission rates based on the applicable Federal emission standards and the emission control technologies characterizing the fleet in various model years.

Cold start: parameter in MOBILE that accounts for additional emissions resulting from a cold-started engine.

Diurnals: the pressure-driven evaporative HC emissions resulting from the daily increase in temperature

Emission rate or factor: expresses the amount of pollution emitted per unit of activity. For highway vehicles, usually in grams of pollutant emitted per mile driven.

FC: Functional code, applied in data management to road segments to identify their type (freeway, local, etc.)

Fuel volatility: The ability of fuel components to evaporate, thus entering the atmosphere as pollution. Fuel volatility is usually measured as Reid Vapor Pressure (RVP) in pounds per square inch. The lower the RVP, the less volatile the fuel.

Growth factor: Factor used to convert volumes to future years

HPMS: Highway Performance Monitoring System, PennDOT's official source of highway information and a subset of RMS.

I/M: Vehicle emissions inspection/maintenance programs ensure that vehicle emission controls are in good working order throughout the life of the vehicle. The programs require vehicles to be tested for emissions. Most vehicles that do not pass must be repaired.

MOBILE: The model EPA has developed and which Pennsylvania uses to estimate emissions from highway vehicles.

Pattern data: Extrapolations of traffic patterns (such as how traffic volume on road segment types varies by time of day, or what kinds of vehicles tend to use a road segment type) from segments with observed data to similar segments.

Program flag: In MOBILE, a numeric code which tells the program such things as how data will be provided by user (or whether default will be used) or how to tailor outputs.

PPAQ: Post-Processor for Air Quality, a set of programs that estimate speeds and processes MOBILE emission rates.

RMS: Roadway Management System, a database maintained by PennDOT from traffic counts and field visits

Scenario: a MOBILE run with a specific set of geographical, time period, highway facility and control strategy assumptions.

Segment: (referred to as link) division of roadway in the PennDOT Roadway Management System. Usually represents 0.5 mile segments of roadway.

UR: Urban/rural code, applied in data management to identify whether a road segment is urban, small urban or rural.

VHT: vehicle hours traveled.

VMT: vehicle miles traveled. In modeling terms, it is the simulated traffic volumes times link length.

Vehicle Type: One of eight types, distinguished primarily by fuel type and/or weight, used in MOBILE modeling.

LIST OF TABULATIONS

Summary VMT, VOC & NOx Inventory and Forecast by County

1999 Summary of VMT, VOC and NOX for Highway Vehicles by County

Scenario		Uncontrolled Baseline		Control Strategy w / Tier 2	
County	VMT	VOC (kg/day)	NOx (kg/day)	VOC (kg/day)	NOx (kg/day)
	Avg Speed	*(tons/day)*	*(tons/day)*	*(tons/day)*	*(tons/day)*
1999					
Allegheny	27,771,819	71,232	69,046	48,113	59,209
	20.9	*78.52*	*76.11*	*53.04*	*65.27*
Armstrong	1,907,338	3,783	5,775	3,204	5,296
	41.0	*4.17*	*6.37*	*3.53*	*5.84*
Beaver	4,519,561	11,003	13,679	7,647	11,968
	26.5	*12.13*	*15.08*	*8.43*	*13.19*
Butler	5,100,834	9,331	16,475	7,775	14,916
	39.2	*10.29*	*18.16*	*8.57*	*16.44*
Fayette	3,107,505	6,568	9,865	5,614	9,074
	41.0	*7.24*	*10.87*	*6.19*	*10.00*
Washington	6,785,582	14,007	24,458	9,884	21,656
	33.8	*15.44*	*26.96*	*10.90*	*23.87*
Westmoreland	10,911,088	24,597	37,363	17,234	33,058
	29.3	*27.11*	*41.19*	*19.00*	*36.44*
Area Total	60,103,727	140,520	176,660	99,472	155,176
	25.8	*154.90*	*194.73*	*109.65*	*171.05*

2007 Summary of VMT, VOC and NOX for Highway Vehicles by County

Scenario		*Uncontrolled Baseline*		*Control Strategy w / Tier 2*	
County	**VMT**	**VOC (kg/day)**	**NOx (kg/day)**	**VOC (kg/day)**	**NOx (kg/day)**
	Avg Speed	*(tons/day)*	*(tons/day)*	*(tons/day)*	*(tons/day)*
2007					
Allegheny	32,317,812 18.0	87,462 *96.41*	74,379 *81.99*	44,968 *49.57*	42,738 *47.11*
Armstrong	2,220,395 40.4	3,971 *4.38*	6,277 *6.92*	2,834 *3.12*	4,197 *4.63*
Beaver	5,283,358 25.5	12,099 *13.34*	15,160 *16.71*	6,540 *7.21*	9,282 *10.23*
Butler	5,991,288 38.3	10,008 *11.03*	18,020 *19.86*	6,888 *7.59*	11,589 *12.77*
Fayette	3,598,250 40.8	6,709 *7.40*	10,679 *11.77*	4,851 *5.35*	7,285 *8.03*
Washington	7,973,138 33.4	15,061 *16.60*	26,736 *29.47*	8,287 *9.13*	16,695 *18.40*
Westmoreland	12,734,303 28.1	27,010 *29.77*	40,792 *44.97*	14,734 *16.24*	25,350 *27.94*
Area Total	70,118,544 23.5	162,320 *178.93*	192,042 *211.69*	89,102 *98.22*	117,136 *129.12*

2011 Summary of VMT, VOC and NOX
for Highway Vehicles by County

Scenario		*Uncontrolled Baseline*		*Control Strategy w / Tier 2*	
County	**VMT**	**VOC (kg/day)**	**NOx (kg/day)**	**VOC (kg/day)**	**NOx (kg/day)**
	Avg Speed	*(tons/day)*	*(tons/day)*	*(tons/day)*	*(tons/day)*
2011					
Allegheny	34,731,975	100,698	78,524	48,062	37,107
	16.5	*111.00*	*86.56*	*52.98*	*40.90*
Armstrong	2,386,656	4,260	6,665	2,877	3,800
	39.7	*4.70*	*7.35*	*3.17*	*4.19*
Beaver	5,690,536	13,088	16,271	6,561	8,419
	25.0	*14.43*	*17.94*	*7.23*	*9.28*
Butler	6,467,797	10,852	19,279	7,074	10,435
	37.5	*11.96*	*21.25*	*7.80*	*11.50*
Fayette	3,857,901	7,103	11,311	4,858	6,644
	40.7	*7.83*	*12.47*	*5.35*	*7.32*
Washington	8,609,590	16,139	28,612	8,257	15,075
	33.2	*17.79*	*31.54*	*9.10*	*16.62*
Westmoreland	13,705,613	29,363	43,614	14,845	22,863
	27.4	*32.37*	*48.08*	*16.36*	*25.20*
Area Total	75,450,068	181,503	204,276	92,533	104,343
	22.1	*200.07*	*225.18*	*102.00*	*115.02*

Pittsburgh Area MOBILE Modeling Parameters

Pittsburgh Area MOBILE
Modeling Parameters

	1999-2011 Uncontrolled Baseline No IM Counties	1999-2011 Uncontrolled Baseline IM Counties	1999-2011 Control Strategy No IM Counties	1999-2011 Control Strategy IM Counties
CONTROL FLAGS				
TAMFLG 1= Use Default, 2= Input	1	1	1	1
SPDFLG 1= One speed All Vehicle Types	1	1	1	1
VMFLAG 1= Use Default, 2= One mix for Each scenario	2	2	2	2
MYRMRFG 1= Use Default, 3= Input Registration Data	3	3	3	3
NEWFLG 1= Use Default BER's, 2= Input Alternative BER's 6= Input Alternative BER's / Disable CAAA BER's	6	6	2	2
IMFLAG 1= No I/M, 2= One I/M, 6 = Include IM control flag record	1	2	1	6
ALHFLG 1= No Emission Factor Adjustments	1	1	1	1
ATPFLG 1= No ATP, 2= ATP, 5= ATP and Pressure 8= ATP, Pressure, and Purge	1	1	1	5
RLFLAG 1= Uncontrolled Refueling, 5= Not modelled in mobile sources	5	5	5	5
TEMFLG 1= Weighted Temps	1	1	1	1
NMHFLG 3= VOC's	3	3	3	3

Pittsburgh Area MOBILE
Modeling Parameters

	1999-2011 Uncontrolled Baseline No IM Counties	1999-2011 Uncontrolled Baseline IM Counties	1999-2011 Control Strategy No IM Counties	1999-2011 Control Strategy IM Counties	
ONE-TIME DATA:					
Registration Distribution Records					
(* Varies by County, using 1999 Registration Data)	*	*	*	*	
Alternate BER Record:					
(* Alternative BER's are entered in the Control Strategy to account for the 2004 HDDE NOx Standard.)	None	None	*	*	
I/M Descriptive Records:	No IM	# 1	No IM	# 1	# 2
Program Start Year		84		97	97
Stringency Level (%)		18		20	20
First Model Year		68		75	81
Last Model Year		20		80	20
Waiver Rate PRE- 81 Vehs (%)		2		3	3
Waiver Rate, Post- 81 Vehs (%)		1		3	3
Compliance Rate (%)		94		96	96
Program Type		2		2	2
1= Test On2= Test & Repair (Computerized)					
Inspection Frequency		1		1	1
1= Annual, 2= Biennial					
Veh. Types Subject to Inspection (1= No, 2= Yes)					
LDGV		2		2	2
LDGT1		2		2	2
LDGT2		2		2	2
HDGV		1		1	1
Test Type		1		1	2
1= Idle, 2= 2 Speed Idle (2500/idle)					
3= ASM, 4= IM240					
Non-Default Cut Points (1= No, 2= Yes)		2		2	2
Alt. I/M Credit Flags(1= Use Default, 2= Input)					
File 1		1		1	1
File 2		1		1	1
Cutpoint for HC		220		220	220
Cutpoint for CO		1.20		1.20	1.20
Cutpoint for NOX		999		999	999

	1999-2011 Uncontrolled Baseline No IM Counties	1999-2011 Uncontrolled Baseline IM Counties	1999-2011 Control Strategy No IM Counties	1999-2011 Control Strategy IM Counties
ONE TIME DATA (Cont'd):				
ATP Descriptive Record:	None	None	None	
Program Start Year				97
First model Year				75
Last Model Year				20
Veh. Types Subject to Inspection (1= No, 2= Yes)				
LDGV				2
LDGT1				2
LDGT2				2
HDGV				1
Program Type (1= Test Only, 2= Test and Repair)				2
Inspection Frequency (1=Annual, 2= Biennial)				1
Compliance Rate (%)				96
Inspections Performed (1= No, 2= Yes)				
Air Pump System				2
Catalyst				2
Fuel Inlet Restrictor				2
Tailpipe Lead Deposit Test				1
EGR System				2
Evaporative Emission Control System				2
PCV System				2
Gas Cap				2
Functional Pressure Test Record:	None	None	None	
Start Year				97
First Model Year				75
Last Model Year				20
Veh. Types Subject to Inspection (1= No, 2= Yes)				
LDGV				2
LDGT1				2
LDGT2				2
HDGV				1
Program Type (1= Test only, 2= Test and repair)				2
Inspection Frequency (1= Annual, 2= Biennial)				1
Compliance Rate (%)				96

	1999-2011 Uncontrolled Baseline No IM Counties	1999-2011 Uncontrolled Baseline IM Counties	1999-2011 Control Strategy No IM Counties	1999-2011 Control Strategy IM Counties
ONE-TIME DATA (Cont'd):				
Functional Purge Test Recod:	None	None	None	
Start Year				97
First Model Year				75
Last Model Year				20
Veh. Types Subject to Inspection (1=No, 2= Yes)				
LDGV				2
LDGT1				2
LDGT2				2
HDGV				1
Program Type (1= Test only, 2= Test and repair)[1]				1
Inspection Frequency (1= Annual, 2= Biennial)				1
Compliance Rate (%)				96
Stage II & Onboard VRS Records:	None	None	None	None

	1999-2011 Uncontrolled Baseline No IM Counties	1999-2011 Uncontrolled Baseline IM Counties	1999-2011 Control Strategy No IM Counties	1999-2011 Control Strategy IM Counties
SCENARIO DATA:				
Scenario Record:				
Region	1	1	4	4
(1= Low Altitude, 4= Low Altitude w/ LEV Program)				
Calendar Year (* either 99, 03, 07, 11)	*	*	*	*
Average Speed	*	*	*	*
(* Varies; Calculated from Network by PPAQ)				
Ambient Temperature	*	*	*	*
(* Varies by Temperature and Time of Day)				
Operating Mode Fractions				
Non-Catalyst, Cold Start	20.6	20.6	20.6	20.6
Catalyst, Hot Start	27.3	27.3	27.3	27.3
Catalyst, Cold Start	20.6	20.6	20.6	20.6
Month of Evaluation	7	7	7	7
NLEV Program Parameter Record:	None	None		
Start Year			99	99
I/M Program (1= Standard or No I/M Program; 2= "Maximum Benefit" I/M Program)			1	1
LDGT2 LEV Program (1= No NLEV program for LDGT2; 2 = NLEV Program for LDGT2)			1	1
Local Area Parameter Record:				
Scenario Name (* Generated by PPAQ)	*	*	*	*
Fuel Volatility Class	C	C	C	C
Minimum Daily Temperature	*	*	*	*
Maximum Daily Temperature	*	*	*	*
(* Varies by County and Time of Day; See attached memo for handling of diurnal emissions by time of day)				
Period 1 RVP (psi) (* Varies by County)	9.0	9.0	7.8	7.8
Period 2 RVP (psi) (* Varies by County)	9.0	9.0	7.8	7.8
Period 2 Start Year	20	20	20	20
Oxygenated Fuel Flag (1= No, 2= Yes)	1	1	1	1
Diesel Sales Fraction Flag (1= No, 2= Yes)	1	1	1	1
Reformulated Gasoline Flag (1= No, 2= Yes)	1	1	1	1
Oxygenated Fuels Record:	None	None	None	None
Diesel Sales Fractions Record:	None	None	None	None
VMT Mix by Vehicle Type (* Varies; Calculated from Network by PPAQ)	*	*	*	*
Additional Correction Factor Record:	None	None	None	None

Control Strategy Emissions Component Breakdown

1999 Control Strategy Emissions Component Breakdown

Scenario	Allegheny County				Armstrong County				Beaver County			
	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)
1999												
Uncontrolled Baseline	71,231.96		69,045.82		3,782.94		5,775.19		11,003.00		13,678.54	
PA97 IM Program		-10,198.65		-2,856.00		0.00		0.00		-1,588.40		-549.09
RVP		-9,813.54		-578.23		-460.70		-45.55		-1,384.80		-102.65
FMVCP (Tier 1)		-3,016.05		-6,330.84		-113.10		-429.38		-367.18		-1,052.27
NLEV		-90.54		-71.92		-4.78		-4.19		-15.57		-6.86
HDDE Standard		0.00		0.00		0.00		0.00		0.00		0.00
Control Stategy	48,113.18		59,208.83		3,204.36		5,296.07		7,647.05		11,967.67	
with Tier 2 Benefits	48,113.18		59,208.83		3,204.36		5,296.07		7,647.05		11,967.67	

Scenario	Butler County				Fayette County				Washington County			
	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)
1999												
Uncontrolled Baseline	9,330.85		16,475.45		6,567.97		9,864.55		14,006.51		24,458.06	
PA97 IM Program		0.00		0.00		0.00		0.00		-1,972.74		-829.88
RVP		-1,146.71		-106.82		-783.94		-86.29		-1,673.61		-145.34
FMVCP (Tier 1)		-386.36		-1,432.95		-165.09		-700.26		-457.11		-1,811.25
NLEV		-22.98		-19.88		-4.63		-4.21		-19.08		-15.87
HDDE Standard		0.00		0.00		0.00		0.00		0.00		0.00
Control Stategy	7,774.80		14,915.80		5,614.31		9,073.79		9,883.97		21,655.72	
with Tier 2 Benefits	7,774.80		14,915.80		5,614.31		9,073.79		9,883.97		21,655.72	

Scenario	Westmoreland County				Pittsburgh (7 County Total)			
	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)
1999								
Uncontrolled Baseline	24,596.63		37,362.86		140,519.86		176,660.47	
PA97 IM Program		-3,497.29		-1,329.15		-17,257.08		-5,564.12
RVP		-3,049.97		-223.23		-18,313.27		-1,288.11
FMVCP (Tier 1)		-793.48		-2,735.96		-5,298.37		-14,492.91
NLEV		-21.86		-16.38		-179.44		-139.31
HDDE Standard		0.00		0.00		0.00		0.00
Control Stategy	17,234.03		33,058.14		99,471.70		155,176.02	
with Tier 2 Benefits	17,234.03		33,058.14		99,471.70		155,176.02	

2007 Control Strategy Emissions Component Breakdown

Scenario	Allegheny County				Armstrong County				Beaver County			
	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)
2007												
Uncontrolled Baseline	87,461.66		74,379.18		3,970.87		6,276.57		12,098.62		15,160.30	
PA97 IM Program		-13,385.92		-4,044.67		0.00		0.00		-1,965.08		-821.32
RVP		-13,039.17		-765.28		-510.46		-65.92		-1,599.53		-133.93
FMVCP (Tier 1)		-12,174.38		-13,627.64		-425.87		-1,007.54		-1,456.40		-2,538.36
NLEV		-2,275.90		-2,033.63		-78.44		-129.49		-275.72		-339.83
HDDE Standard		0.00		-2,684.90		0.00		-233.51		0.00		-670.56
Control Stategy	46,586.29		51,223.06		2,956.10		4,840.11		6,801.89		10,656.30	
with Tier 2 Benefits	44,968.23		42,737.59		2,834.32		4,197.44		6,539.76		9,281.57	

Scenario	Butler County				Fayette County				Washington County			
	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)
2007												
Uncontrolled Baseline	10,007.92		18,019.84		6,709.38		10,679.06		15,061.12		26,735.51	
PA97 IM Program		0.00		0.00		0.00		0.00		-2,386.25		-1,217.84
RVP		-1,313.14		-144.01		-848.19		-117.23		-1,843.44		-181.75
FMVCP (Tier 1)		-1,230.94		-3,209.52		-687.62		-1,659.95		-1,793.37		-4,515.16
NLEV		-250.88		-419.41		-124.14		-211.13		-362.01		-526.55
HDDE Standard		0.00		-942.29		0.00		-360.32		0.00		-1,558.37
Control Stategy	7,212.96		13,304.61		5,049.43		8,330.43		8,676.05		18,735.84	
with Tier 2 Benefits	6,887.83		11,589.12		4,851.32		7,284.87		8,286.87		16,695.13	

Scenario	Westmoreland County				Pittsburgh (7 County Total)			
	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)
2007								
Uncontrolled Baseline	27,010.32		40,791.64		162,319.89		192,042.10	
PA97 IM Program		-4,303.07		-1,949.17		-22,040.32		-8,033.00
RVP		-3,496.81		-287.15		-22,650.74		-1,695.27
FMVCP (Tier 1)		-3,232.34		-6,843.05		-21,000.92		-33,401.22
NLEV		-620.84		-807.78		-3,987.93		-4,467.82
HDDE Standard		0.00		-2,283.75		0.00		-8,733.70
Control Stategy	15,357.26		28,620.74		92,639.98		135,711.09	
with Tier 2 Benefits	14,733.60		25,350.32		89,101.92		117,136.04	

2011 Control Strategy Emissions Component Breakdown

Scenario	Allegheny County				Armstrong County				Beaver County			
	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)
2011												
Uncontrolled Baseline	100,698.39		78,523.54		4,259.84		6,664.59		13,088.31		16,270.87	
PA97 IM Program		-15,377.05		-4,325.63		0.00		0.00		-2,121.67		-897.14
RVP		-15,394.22		-852.75		-546.90		-70.46		-1,729.81		-141.71
FMVCP (Tier 1)		-16,473.95		-15,503.42		-579.86		-1,187.49		-1,934.61		-3,001.21
NLEV		-3,319.29		-2,758.75		-116.90		-190.86		-407.07		-485.34
HDDE Standard		0.00		-4,579.21		0.00		-398.27		0.00		-1,160.62
Control Stategy	50,133.88		50,503.78		3,016.18		4,817.51		6,895.15		10,584.85	
with Tier 2 Benefits	48,062.07		37,106.57		2,876.68		3,800.50		6,560.51		8,418.84	

Scenario	Butler County				Fayette County				Washington County			
	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)
2011												
Uncontrolled Baseline	10,851.67		19,279.41		7,103.00		11,310.62		16,139.22		28,612.44	
PA97 IM Program		0.00		0.00		0.00		0.00		-2,555.90		-1,343.02
RVP		-1,445.92		-160.87		-895.64		-129.81		-1,966.53		-189.99
FMVCP (Tier 1)		-1,613.99		-3,768.22		-936.21		-1,953.61		-2,354.56		-5,361.86
NLEV		-345.18		-573.93		-186.91		-317.18		-512.09		-756.39
HDDE Standard		0.00		-1,626.42		0.00		-613.30		0.00		-2,688.00
Control Stategy	7,446.58		13,149.97		5,084.24		8,296.72		8,750.14		18,273.18	
with Tier 2 Benefits	7,074.22		10,435.26		4,857.55		6,644.11		8,256.69		15,074.71	

Scenario	Westmoreland County				Pittsburgh (7 County Total)			
	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)	VOC (kg/d)	VOC Credit (kg/d)	NOx (kg/d)	NOx Credit (kg/d)
2011								
Uncontrolled Baseline	29,362.62		43,614.19		181,503.05		204,275.66	
PA97 IM Program		-4,685.28		-2,134.55		-24,739.90		-8,700.34
RVP		-3,816.93		-305.46		-25,795.95		-1,851.05
FMVCP (Tier 1)		-4,316.14		-8,096.47		-28,209.32		-38,872.28
NLEV		-909.71		-1,158.97		-5,797.15		-6,241.42
HDDE Standard		0.00		-3,938.82		0.00		-15,004.64
Control Stategy	15,634.56		27,979.92		96,960.73		133,605.93	
with Tier 2 Benefits	14,844.85		22,862.60		92,532.57		104,342.59	

VMT, VOC, CO and Nox Inventory and Forecast Emissions by County by Functional Class

1999 VMT, VOC, and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	1999 VMT	1999 - 1999 Growth	1999 VHT	1999 Speed (mph)	1999 Baseline	1999 Control Strategy	1999 Baseline	1999 Control Strategy
Allegheny County								
Rural								
2 Other Prin. Arterial	131,959	1.00	2,273	58.1	182.62	130.55	452.08	392.75
						-29 %		-13 %
6 Minor Arterial	123,388	1.00	2,505	49.2	165.13	115.28	299.51	256.15
						-30 %		-14 %
7 Major Collector	70,794	1.00	1,789	39.6	111.43	77.47	170.52	147.07
						-30 %		-14 %
8 Minor Collector	19,136	1.00	483	39.6	30.00	20.84	45.63	39.27
						-31 %		-14 %
9 Local	70,874	1.00	2,458	28.8	141.57	98.40	167.36	144.23
						-30 %		-14 %
Subtotal (kg)	416,151		9,508	43.8	630.75	442.54	1,135.10	979.47
(tons)					0.70	0.49	1.25	1.08
Urban								
11 Interstate	5,712,431	1.00	135,216	42 2	9,099.02	6,426.13	17,965.98	15,826.66
						-29 %		-12 %
12 Other Fwy/Ex	2,479,746	1.00	40,695	60.9	3,578 14	2,545.88	8,409.79	7,199.42
						-29 %		-14 %
14 Prin. Arterial	7,526,897	1.00	272,155	27.7	15,460.95	10,620.17	16,225.45	13,763.77
						-31 %		-15 %
16 Minor Arterial	5,974,742	1.00	314,283	19.0	16,479 56	11,179.80	12,414.14	10,497.16
						-32 %		-15 %
17 Collector	2,356,400	1.00	184,144	12.8	9,077 68	5,951.95	5,159 08	4,372.92
						-34 %		-15 %
19 Local	3,305,452	1.00	374,638	8.8	16,905.86	10,946.71	7,736.28	6,569.43
						-35 %		-15 %
Subtotal (kg)	27,355,668		1,321,130	20.7	70,601.21	47,670.64	67,910.72	58,229 36
(tons)					77 82	52.55	74.86	64 19
Allegheny County Totals (kg)	27,771,819		1,330,639	20.9	71,231.96	48,113.18	69,045.82	59,208.83
(tons)					78.52	53.04	76.11	65.27
with Tier 2 Credits						48,113.18		59,208.83
						53.04		65.27
Armstrong County								
Rural								
2 Other Prin. Arterial	474,681	1.00	8,091	58.7	838.19	724.27	1,820.75	1,673.85
						-14 %		-8 %
6 Minor Arterial	392,732	1.00	7,988	49.2	658.61	557.45	1,108.31	1,016.01
						-15 %		-8 %
7 Major Collector	208,796	1.00	5,233	39 9	405.07	340.02	589.82	543.19
						-16 %		-8 %
8 Minor Collector	131,319	1.00	3,316	39.6	254.99	213.81	352.93	323.95
						-16 %		-8 %

1999 VMT, VOC, and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	1999 VMT	1999 - 1999 Growth	1999 VHT	1999 Speed (mph)	1999 Baseline	1999 Control Strategy	1999 Baseline	1999 Control Strategy
9 Local	228,102	1.00	7,845	29.1	557 .37	467 .02	603 .70	553 .73
						-16 %		-8 %
Subtotal (kg)	1,435,630		32,473	44.2	2,714 .23	2,302 .57	4,475 .51	4,110 .73
(tons)					2 .99	2 .54	4 .93	4 .53
Small Urban								
12 Other Fwy/Ex	56,268	1.00	866	65.0	112 .25	98 .86	255 .10	234 .94
						-12 %		-8 %
14 Prin. Arterial	117,193	1.00	2,315	50.6	199 .86	169 .81	345 .51	315 .79
						-15 %		-9 %
16 Minor Arterial	181,018	1.00	6,115	29.6	433 .66	362 .69	416 .91	377 .73
						-16 %		-9 %
17 Collector	52,184	1.00	1,974	26.4	136 .19	114 .06	123 .81	112 49
						-16 %		-9 %
19 Local	55,582	1.00	2,357	23.6	158 .31	132 .79	135 .73	123 .82
						-16 %		-9 %
Subtotal (kg)	462,245		13,626	33.9	1,040 .27	878 .21	1,277 .06	1,164 .77
(tons)					1 15	0 .97	1 .41	1 .28
Urban								
14 Prin. Arterial	4,790	1 00	155	30.9	11 14	9 .34	12 .02	10 .97
						-16 %		-9 %
17 Collector	4,673	1.00	275	17 0	17 30	14 .24	10 .60	9 .60
						-18 %		-9 %
Subtotal (kg)	9,463		430	22.0	28 44	23 .58	22 .62	20 .57
(tons)					0 03	0 .03	0 .02	0 .02
Armstrong County Totals (kg)	1,907,338		46,529	41 0	3,782 .94	3,204 .36	5,775 .19	5,296 07
(tons)					4 17	3 .53	6 .37	5 .84
with Tier 2 Credits						3,204 .36		5,296 .07
						3 .53		5 .84
Beaver County								
Rural								
1 Intersate	225,221	1.00	3,465	65.0	396 .02	295 .81	1,433 .37	1,312 .74
						-25 %		-8 %
2 Other Prin Arterial	141,605	1.00	2,417	58.6	221 .88	159 .55	522 .84	458 .87
						-28 %		-12 %
6 Minor Arterial	362,069	1.00	7,382	49.0	542 .33	383 .69	961 24	836 .08
						-29 %		-13 %
7 Major Collector	184,739	1.00	4,654	39.7	322 .11	226 .59	477 .41	416 .66
						-30 %		-13 %
8 Minor Collector	72,132	1.00	1,822	39.6	125 .55	88 .53	182 .66	158 .96
						-29 %		-13 %
9 Local	199,917	1.00	6,889	29.0	438 .35	306 .96	485 .45	421 .08
						-30 %		-13 %
Subtotal (kg)	1,185,683		26,628	44.5	2,046 .24	1,461 .13	4,062 .97	3,604 .39

1999 VMT, VOC and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	1999 VMT	1999 - 1999 Growth	1999 VHT	1999 Speed (mph)	1999 Baseline	1999 Control Strategy	1999 Baseline	1999 Control Strategy
(tons)					2 .26	1 .61	4 .48	3 .97
Urban								
11 Interstate	186,177	1.00	2,864	65.0	328 .91	245 .75	1,198 .07	1,098 .23
						-25 %		-8 %
12 Other Fwy/Ex	669,658	1.00	10,467	64.0	1,145 .44	829 .99	2,685 .55	2,338 .16
						-28 %		-13 %
14 Prin. Arterial	1,038,467	1.00	34,572	30.0	2,214 .90	1,542 .04	2,421 .35	2,084 .98
						-30 %		-14 %
16 Minor Arterial	592,549	1.00	28,259	21 0	1,651 .50	1,144 .97	1,315 .47	1,128 .28
						-31 %		-14 %
17 Collector	398,476	1.00	24,933	16.0	1,406 .39	956 .01	917 .57	788 .87
						-32 %		-14 %
19 Local	448,551	1 00	42,982	10.4	2,209 .62	1,467 .16	1,077 .56	924 .76
						-34 %		-14 %
Subtotal (kg)	3,333,878		144,077	23.1	8,956 .76	6,185 .92	9,615 .57	8,363 .28
(tons)					9 .87	6 .82	10 .60	9 .22
Beaver County Totals (kg)	4,519,561		170,705	26 5	11,003 .00	7,647 .05	13,678 .54	11,967 .67
(tons)					12 .13	8 .43	15 .08	13 .19
with Tier 2 Credits						7,647 .05		11,967 .67
						8 .43		13 .19
Butler County								
Rural								
1 Interstate	771,487	1.00	11,869	65.0	1,301 .25	1,127 .10	4,025 .54	3,706 .39
						-13 %		-8 %
2 Other Prin. Arterial	745,218	1 00	12,995	57.3	1,098 .54	930 .13	2,574 .49	2,327 .93
						-15 %		-10 %
6 Minor Arterial	912,665	1 00	19,087	47.8	1,330 28	1,107 .34	2,274 .75	2,039 .38
						-17 %		-10 %
7 Major Collector	489,593	1.00	12,334	39 7	816 .68	673 .51	1,166 .97	1,044 .52
						-18 %		-10 %
8 Minor Collector	99,786	1.00	2,514	39.7	167 .46	138 .21	253 .19	228 .08
						-17 %		-10 %
9 Local	421,518	1.00	14,496	29.1	896 .59	737 .21	1,047 .05	943 .74
						-18 %		-10 %
Subtotal (kg)	3,440,267		73,294	46.9	5,610 .80	4,713 .50	11,341 .99	10,290 .04
(tons)					6 .18	5 .20	12 .50	11 .34
Small Urban								
12 Other Fwy/Ex	110,540	1.00	1,701	65.0	187 .09	162 .68	444 .13	400 .36
						-13 %		-10 %
14 Prin. Arterial	320,955	1.00	5,744	55.9	456 .21	384 .61	923 .25	820 .99
						-16 %		-11 %
16 Minor Arterial	181,505	1.00	6,013	30.2	371 .89	304 .55	387 .26	342 .74
						-18 %		-11 %

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	1999 VMT	1999 - 1999 Growth	1999 VHT	1999 Speed (mph)	1999 Baseline	1999 Control Strategy	1999 Baseline	1999 Control Strategy
17 Collector	89,923	1.00	3,442	26.1	205 .05	168 .34 -18 %	193 .41	171 .53 -11 %
19 Local	83,776	1.00	3,565	23.5	208 .39	171 .37 -18 %	198 .79	178 .44 -10 %
Subtotal (kg) (tons)	786,699		20,464	38.4	1,428 .63 1 .57	1,191 .55 1 .31	2,146 .84 2 .37	1,914 .06 2 .11
Urban								
11 Interstate	304,845	1.00	4,696	64.9	515 .13	445 .92 -13 %	1,592 .46	1,465 .17 -8 %
12 Other Fwy/Ex	46,443	1.00	726	64.0	76 .98	66 .82 -13 %	173 .19	155 .09 -10 %
14 Prin. Arterial	150,537	1.00	5,510	27.3	335 .39	274 .60 -18 %	355 .95	319 .21 -10 %
16 Minor Arterial	195,791	1.00	10,567	18.5	591 .75	479 .71 -19 %	438 .30	390 .88 -11 %
17 Collector	80,761	1.00	7,190	11.2	366 .86	284 .56 -22 %	181 .58	161 .00 -11 %
19 Local	95,491	1.00	7,767	12.3	405 .31	318 .14 -22 %	245 .14	220 .35 -10 %
Subtotal (kg) (tons)	873,868		36,456	24.0	2,291 .42 2 .53	1,869 .75 2 06	2,986 .62 3 .29	2,711 .70 2 .99
Butler County Totals (kg) **(tons)**	5,100,834		130,213	39.2	9,330 .85 10 29	7,774 .80 8 .57	16,475 .45 18 .16	14,915 .80 16 .44
with Tier 2 Credits						7,774 .80 8 .57		14,915 .80 16 .44
Fayette County								
Rural								
2 Other Prin. Arterial	887,973	1 00	15,230	58.3	1,631 .50	1,417 .52 -13 %	3,386 .95	3,124 .57 -8 %
6 Minor Arterial	270,715	1.00	5,467	49.5	475 .21	404 .05 -15 %	806 .13	743 .25 -8 %
7 Major Collector	511,934	1.00	12,949	39.5	1,036 31	876 .04 -15 %	1,364 .43	1,252 46 -8 %
8 Minor Collector	150,726	1.00	3,803	39.6	305 .27	258 .02 -15 %	409 .77	376 .99 -8 %
9 Local	316,638	1.00	10,957	28.9	810 .42	683 .82 -16 %	845 .98	778 .58 -8 %
Subtotal (kg) (tons)	2,137,986		48,406	44.2	4,258 .71 4 .69	3,639 .45 4 .01	6,813 .26 7 .51	6,275 .85 6 .92
Small Urban								
12 Other Fwy/Ex	199,244	1.00	3,065	65.0	420 .29	373 .54 -11 %	821 .53	754 .06 -8 %
14 Prin. Arterial	307,701	1.00	5,375	57.3	550 .05	476 .95 -13 %	1,077 .46	989 .23 -8 %

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	1999 VMT	1999 - 1999 Growth	1999 VHT	1999 Speed (mph)	1999 Baseline	1999 Control Strategy	1999 Baseline	1999 Control Strategy
16 Minor Arterial	175,148	1.00	5,756	30.4	430 .74	362 .73 -16 %	436 .29	399 .18 -9 %
17 Collector	92,887	1.00	3,544	26.2	255 .39	215 .39 -16 %	229 .00	209 .35 -9 %
19 Local	95,480	1.00	4,046	23.6	284 .00	239 .84 -16 %	236 .52	216 .41 -9 %
Subtotal (kg) (tons)	870,460		21,786	40.0	1,940 .47 2 .14	1,668 .45 1 .84	2,800 .80 3 .09	2,568 .23 2 .83
Urban								
14 Prin Arterial	6,563	1.00	214	30.7	16 .11	13 .55 -16 %	18 .46	17 .04 -8 %
16 Minor Arterial	45,044	1.00	2,100	21.4	144 .02	121 .34 -16 %	106 .62	97 .40 -9 %
17 Collector	33,744	1.00	2,139	15 8	139 .91	115 .57 -17 %	91 .02	83 .86 -8 %
19 Local	13,708	1.00	1,115	12 3	68 .75	55 .95 -19 %	34 .39	31 .41 -9 %
Subtotal (kg) (tons)	99,059		5,568	17 8	368 .79 0 41	306 .41 0 .34	250 .49 0 .28	229 .71 0 .25
Fayette County Totals (kg) (tons)	3,107,505		75,760	41.0	6,567 .97 7 24	5,614 .31 6 .19	9,864 .55 10 .87	9,073 .79 10 .00
with Tier 2 Credits						5,614 31 6 19		9,073 .79 10 .00
Washington County								
Rural								
1 Interstate	1,232,425	1 00	18,961	65.0	2,085 61	1,543 .98 -26 %	6,924 73	6,266 07 -10 %
2 Other Prin. Artenal	382,929	1.00	6,518	58.8	578 .71	415 .96 -28 %	1,360 .55	1,185 .93 -13 %
6 Minor Arterial	644,050	1 00	13,192	48.8	936 .22	659 .66 -30 %	1,675 .83	1,454 .36 -13 %
7 Major Collector	529,770	1.00	13,471	39.3	891 .41	623 .25 -30 %	1,259 .58	1,084 .61 -14 %
8 Minor Collector	219,181	1.00	5,552	39.5	370 .77	260 .67 -30 %	548 44	475 .98 -13 %
9 Local	477,922	1.00	16,481	29.0	1,020 .00	716 .75 -30 %	1,179 .20	1,024 .56 -13 %
Subtotal (kg) (tons)	3,486,277		74,175	47.0	5,882 .72 6 .48	4,220 .27 4 .65	12,948 .33 14 .27	11,491 .51 12 .67
Urban								
11 Interstate	1,299,669	1.00	20,100	64.7	2,189 .74	1,616 .10 -26 %	6,951 .12	6,265 .39 -10 %
12 Other Fwy/Ex	44,090	1.00	689	64.0	72 .30	52 .32	174 .21	151 .31

1999 VMT, VOC, and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	1999 VMT	1999 - 1999 Growth	1999 VHT	1999 Speed (mph)	1999 Baseline	1999 Control Strategy	1999 Baseline	1999 Control Strategy
						-28 %		-13 %
14 Prin. Arterial	536,232	1.00	18,376	29.2	1,126.38	780.69	1,177.49	1,003.01
						-31 %		-15 %
16 Minor Arterial	737,079	1.00	34,769	21.2	1,973.12	1,364.32	1,603.79	1,368.24
						-31 %		-15 %
17 Collector	291,651	1.00	18,129	16.1	991.76	670.31	645.26	551.46
						-32 %		-15 %
19 Local	390,584	1.00	34,798	11.2	1,770.49	1,179.96	957.86	824.80
						-33 %		-14 %
Subtotal (kg)	3,299,305		126,861	26.0	8,123.79	5,663.70	11,509.73	10,164.21
(tons)					8.95	6.24	12.69	11.20
Washington County Totals (kg)	6,785,582		201,036	33.8	14,006.51	9,883.97	24,458.06	21,655.72
(tons)					15.44	10.90	26.96	23.87
with Tier 2 Credits						9,883.97		21,655.72
						10.90		23.87
Westmoreland County								
Rural								
1 Interstate	780,438	1.00	12,010	65.0	1,333.70	1,004.76	5,368.36	4,949.56
						-25 %		-8 %
2 Other Prin Arterial	1,110,812	1.00	19,510	56.9	1,648.35	1,182.87	3,753.94	3,271.74
						-28 %		-13 %
6 Minor Arterial	934,913	1.00	19,271	48.5	1,387.30	980.47	2,488.02	2,169.48
						-29 %		-13 %
7 Major Collector	546,314	1.00	13,963	39.1	940.26	658.34	1,314.05	1,133.99
						-30 %		-14 %
8 Minor Collector	202,175	1.00	5,114	39.5	347.12	244.42	517.78	450.74
						-30 %		-13 %
9 Local	618,024	1.00	21,977	28.1	1,368.76	958.95	1,501.70	1,303.38
						-30 %		-13 %
Subtotal (kg)	4,192,676		91,845	45.6	7,025.49	5,029.81	14,943.85	13,278.89
(tons)					7.74	5.54	16.47	14.64
Small Urban								
12 Other Fwy/Ex	103,459	1.00	1,592	65.0	177.83	129.95	451.52	396.48
						-27 %		-12 %
14 Prin. Arterial	117,846	1.00	2,087	56.5	172.57	122.75	368.15	317.52
						-29 %		-14 %
16 Minor Arterial	253,832	1.00	8,630	29.4	540.81	376.13	573.14	490.96
						-30 %		-14 %
17 Collector	146,121	1.00	5,695	25.7	345.48	240.58	339.77	292.79
						-30 %		-14 %
19 Local	72,655	1.00	3,089	23.5	181.94	125.19	147.19	123.78
						-31 %		-16 %
Subtotal (kg)	693,913		21,092	32.9	1,418.63	994.60	1,879.77	1,621.53

1999 VMT, VOC and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	1999 VMT	1999 - 1999 Growth	1999 VHT	1999 Speed (mph)	1999 Baseline	1999 Control Strategy	1999 Baseline	1999 Control Strategy
(tons)					1 .56	1 .10	2 .07	1 .79
Urban								
11 Interstate	1,488,334	1.00	22,940	64.9	2,549 .44	1,900 .69	9,112 .98	8,319 .25
						-25 %		-9 %
12 Other Fwy/Ex	592,164	1.00	9,273	63.9	992 .77	720 .70	2,329 .84	2,024 .86
						-27 %		-13 %
14 Prin. Arterial	1,347,572	1.00	49,143	27.4	3,031 .20	2,107 .97	3,072 .84	2,638 .48
						-30 %		-14 %
16 Minor Arterial	1,036,265	1.00	49,911	20.8	2,872 .11	1,989 .92	2,296 .79	1,967 .63
						-31 %		-14 %
17 Collector	823,928	1.00	53,639	15.4	2,966 .86	2,006 .18	1,889 .81	1,623 .89
						-32 %		-14 %
19 Local	736,236	1.00	74,621	9.9	3,740 .13	2,484 .16	1,836 .98	1,583 .61
						-34 %		-14 %
Subtotal (kg)	6,024,499		259,527	23.2	16,152 .51	11,209 .62	20,539 .24	18,157 .72
(tons)					17 .81	12 .36	22 .64	20 .02
Westmoreland County								
Totals (kg)	10,911,088		372,464	29.3	24,596 .63	17,234 .03	37,362 .86	33,058 .14
(tons)					27 .11	19 00	41 .19	36 .44
with Tier 2 Credits						17,234 .03		33,058 .14
						19 .00		36 .44
Summary Total								
Pittsburgh Area	60,103,727		2,327,345	25.8	140,519 .86	99,471 .70	176,660 .47	155,176 .02
Totals (kg)						109 .65		171 .05
(tons)								
						99,471 .70		155,176 .02
with Tier 2 Credits						109 .65		171 .05

2007 VMT, VOC and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2007 VMT	1999 - 2007 Growth	2007 VHT	2007 Speed (mph)	2007 Baseline	2007 Control Strategy	2007 Baseline	2007 Control Strategy
Allegheny County								
Rural								
2 Other Prin. Arterial	153,692	1.16	2,676	57.4	191 .39	112 .74	482 .96	333 .97
						-41 %		-31 %
6 Minor Arterial	143,712	1.16	2,934	49.0	178 .20	102 .04	330 .06	228 .13
						-43 %		-31 %
7 Major Collector	82,457	1.16	2,092	39.4	121 .24	68 .86	189 .01	131 .07
						-43 %		-31 %
8 Minor Collector	22,294	1.17	563	39.6	32 .65	18 .50	50 .69	35 .09
						-43 %		-31 %
9 Local	82,545	1.16	2,873	28.7	156 .10	87 .91	186 .10	128 .68
						-44 %		-31 %
Subtotal (kg)	484,700		11,138	43.5	679 .58	390 .05	1,238 .82	856 .94
(tons)					0 75	0 .43	1 .37	0 .94
Urban								
11 Interstate	6,788,672	1 19	251,185	27.0	13,826 .52	7,807 .45	18,063 .97	12,526 .41
						-44 %		-31 %
12 Other Fwy/Ex	2,946,933	1.19	53,318	55.3	3,663 19	2,120 .37	8,233 .69	5,671 .76
						-42 %		-31 %
14 Prin. Arterial	8,679,273	1.15	331,128	26.2	17,662 96	9,718 .21	18,026 .28	12,416 .28
						-45 %		-31 %
16 Minor Arterial	6,889,501	1.15	388,911	17.7	19,461 66	10,379 .65	14,013 .60	9,611 .73
						-47 %		-31 %
17 Collector	2,717,145	1.15	250,764	10.8	11,295 55	5,711 .54	5,918 29	4,057 .11
						-49 %		-31 %
19 Local	3,811,588	1.15	504,813	7.6	20,872 .20	10,459 .02	8,884 .53	6,082 .83
						-50 %		-32 %
Subtotal (kg)	31,833,112		1,780,118	17.9	86,782 .08	46,196 .24	73,140 36	50,366 .12
(tons)					95 .66	50 .92	80 .62	55 .52
Allegheny County Totals (kg)	32,317,812		1,791,256	18.0	87,461 .66	46,586 .29	74,379 .18	51,223 .06
(tons)					96 .41	51 .35	81 .99	56 .46
with Tier 2 Credits						44,968 .23		42,737 .59
						49 .57		47 .11
Armstrong County								
Rural								
2 Other Prin. Arterial	552,857	1.16	9,493	58.2	841 .07	642 .05	1,942 .74	1,492 .95
						-24 %		-23 %
6 Minor Arterial	457,422	1.16	9,354	48.9	684 .48	511 .40	1,213 .01	935 .95
						-25 %		-23 %
7 Major Collector	243,176	1.16	6,110	39.8	424 .09	314 .07	648 .82	499 .14
						-26 %		-23 %
8 Minor Collector	152,938	1 16	3,862	39.6	267 .49	197 .85	390 .70	301 .67
						-26 %		-23 %

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2007 VMT	1999 - 2007 Growth	2007 VHT	2007 Speed (mph)	2007 Baseline	2007 Control Strategy	2007 Baseline	2007 Control Strategy
9 Local	265,684	1.16	9,150	29.0	592 .54	435 .92	670 .01	516 .71
						-26 %		-23 %
Subtotal (kg)	1,672,077		37,969	44.0	2,809 .67	2,101 .29	4,865 .28	3,746 .42
(tons)					3 .10	2 .32	5 .36	4 .13
Small Urban								
12 Other Fwy/Ex	66,871	1.19	1,029	65.0	112 .01	87 .64	278 .45	213 .21
						-22 %		-23 %
14 Prin. Arterial	135,812	1.16	3,215	42.2	232 .13	171 .39	348 .51	270 .75
						-26 %		-22 %
16 Minor Arterial	209,784	1.16	7,285	28.8	471 .63	343 .36	468 .61	365 .05
						-27 %		-22 %
17 Collector	60,479	1.16	2,295	26.4	145 .62	106 .45	138 .72	107 .64
						-27 %		-22 %
19 Local	64,405	1.16	2,732	23.6	169 .19	123 .96	151 .62	117 .41
						-27 %		-23 %
Subtotal (kg)	537,351		16,556	32.5	1,130 .58	832 .80	1,385 .91	1,074 .06
(tons)					1 .25	0 .92	1 .53	1 .18
Urban								
14 Prin. Arterial	5,551	1.16	181	30.7	11 .88	8 .68	13 .37	10 .33
						-27 %		-23 %
17 Collector	5,416	1.16	321	16 9	18 74	13 .33	12 .01	9 30
						-29 %		-23 %
Subtotal (kg)	10,967		502	21 9	30 .62	22 .01	25 .38	19 .63
(tons)					0 .03	0 02	0 .03	0 .02
Armstrong County Totals (kg)	2,220,395		55,026	40 4	3,970 .87	2,956 .10	6,276 .57	4,840 .11
(tons)					4 .38	3 .26	6 .92	5 .34
with Tier 2 Credits						2,834 .32		4,197 .44
						3 .12		4 .63
Beaver County								
Rural								
1 Intersate	275,819	1 22	4,243	65.0	413 .74	265 50	1,575 .94	1,108 .48
						-36 %		-30 %
2 Other Prin. Artenal	164,928	1.16	2,840	58.1	227 .12	136 .56	559 .55	394 .33
						-40 %		-30 %
6 Minor Arterial	421,693	1.16	8,659	48.7	573 .88	337 .25	1,053 .44	744 .74
						-41 %		-29 %
7 Major Collector	215,166	1.16	5,434	39.6	343 .64	199 .69	529 .32	374 .01
						-42 %		-29 %
8 Minor Collector	84,010	1.16	2,125	39.5	134 .26	77 .72	203 06	143 .36
						-42 %		-29 %
9 Local	232,839	1.16	8,023	29.0	473 .19	270 .82	543 .01	382 .54
						-43 %		-30 %
Subtotal (kg)	1,394,455		31,325	44.5	2,165 .83	1,287 .54	4,464 .32	3,147 .46

2007 VMT, VOC and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2007 VMT	1999 - 2007 Growth	2007 VHT	2007 Speed (mph)	2007 Baseline	2007 Control Strategy	2007 Baseline	2007 Control Strategy
(tons)					2 .39	1 .42	4 .92	3 .47
Urban								
11 Interstate	221,247	1.19	3,404	65.0	333 .25	214 .10	1,277 .65	898 .78
						-36 %		-30 %
12 Other Fwy/Ex	795,839	1.19	12,454	63.9	1,182 .04	710 .12	2,956 .38	2,077 .73
						-40 %		-30 %
14 Prin. Arterial	1,203,478	1.16	40,809	29.5	2,420 .74	1,367 .86	2,708 .61	1,905 .17
						-43 %		-30 %
16 Minor Arterial	686,702	1.16	33,627	20.4	1,844 .40	1,034 .96	1,481 .37	1,037 .96
						-44 %		-30 %
17 Collector	461,784	1.16	29,662	15.6	1,566 .86	845 .13	1,035 .46	725 .06
						-46 %		-30 %
19 Local	519,853	1.16	55,620	9.3	2,585 .50	1,342 .18	1,236 .51	864 .14
						-48 %		-30 %
Subtotal (kg)	3,888,903		175,575	22.1	9,932 .79	5,514 .35	10,695 .98	7,508 .84
(tons)					10 .95	6 .08	11 .79	8 .28
Beaver County Totals (kg)	5,283,358		206,900	25.5	12,098 .62	6,801 .89	15,160 .30	10,656 .30
(tons)					13 .34	7 .50	16 71	11 .75
with Tier 2 Credits						6,539 .76		9,281 .57
						7 .21		10 .23
Butler County								
Rural								
1 Interstate	944,842	1.22	14,554	64.9	1,362 .40	1,044 .43	4,461 .71	3,253 .18
						-23 %		-27 %
2 Other Prin Arterial	867,955	1.16	15,376	56.4	1,122 .50	830 .15	2,724 .28	2,018 .75
						-26 %		-26 %
6 Minor Arterial	1,063,007	1.16	22,590	47 1	1,424 .14	1,026 .38	2,496 .93	1,858 .54
						-28 %		-26 %
7 Major Collector	570,223	1.16	14,424	39.5	874 .67	623 .84	1,295 .62	964 .67
						-29 %		-26 %
8 Minor Collector	116,219	1.16	2,929	39.7	178 .18	127 .77	279 .24	207 33
						-28 %		-26 %
9 Local	490,964	1.16	16,918	29.0	964 .40	685 .35	1,157 .79	858 .91
						-29 %		-26 %
Subtotal (kg)	4,053,210		86,790	46.7	5,926 .29	4,337 .92	12,415 .57	9,161 .38
(tons)					6 .53	4 .78	13 .69	10 .10
Small Urban								
12 Other Fwy/Ex	131,367	1.19	2,022	65.0	191 .02	145 .33	487 .89	361 .36
						-24 %		-26 %
14 Prin. Arterial	371,951	1.16	6,816	54.6	473 .77	346 .88	976 .60	729 .30
						-27 %		-25 %
16 Minor Arterial	210,345	1.16	7,086	29.7	405 .08	284 .09	433 59	323 .98
						-30 %		-25 %

2007 VMT, VOC, and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2007 VMT	1999 - 2007 Growth	2007 VHT	2007 Speed (mph)	2007 Baseline	2007 Control Strategy	2007 Baseline	2007 Control Strategy
17 Collector	104,213	1.16	4,020	25.9	222 .80	156 .74	216 .53	161 .65
						-30 %		-25 %
19 Local	97,091	1.16	4,132	23.5	224 .46	159 .44	219 .76	163 .30
						-29 %		-26 %
Subtotal (kg)	914,967		24,075	38.0	1,517 .13	1,092 .48	2,334 .37	1,739 .59
(tons)					1 .67	1 .20	2 .57	1 .92
Urban								
11 Interstate	362,276	1.19	5,591	64.8	522 .80	399 .70	1,709 .98	1,246 .73
						-24 %		-27 %
12 Other Fwy/Ex	55,194	1.19	862	64.0	78 .93	59 .73	191 .19	142 .29
						-24 %		-26 %
14 Prin. Arterial	174,457	1.16	6,704	26.0	373 .56	264 .95	393 .98	292 .63
						-29 %		-26 %
16 Minor Arterial	226,903	1.16	13,064	17.4	681 .57	466 .42	492 .86	365 .94
						-32 %		-26 %
17 Collector	93,594	1.16	10,366	9.0	469 .98	301 .96	210 .94	156 .53
						-36 %		-26 %
19 Local	110,687	1.16	9,077	12 2	437 .66	289 .80	270 .95	199 .52
						-34 %		-26 %
Subtotal (kg)	1,023,111		45,664	22 4	2,564 .50	1,782 .56	3,269 .90	2,403 .64
(tons)					2 .83	1 .96	3 .60	2 .65
Butler County Totals (kg)	5,991,288		156,529	38 3	10,007 .92	7,212 .96	18,019 .84	13,304 .61
(tons)					11 .03	7 .95	19 .86	14 .67
with Tier 2 Credits						6,887 .83		11,589 .12
						7 59		12 77
Fayette County								
Rural								
2 Other Prin. Arterial	1,029,078	1.16	17,811	57.8	1,612 .07	1,240 55	3,594 .21	2,793 .70
						-23 %		-22 %
6 Minor Arterial	313,729	1.16	6,357	49.4	485 .09	366 .39	876 77	682 .03
						-24 %		-22 %
7 Major Collector	593,286	1.16	15,055	39.4	1,078 .12	801 .33	1,508 .19	1,179 .18
						-26 %		-22 %
8 Minor Collector	174,703	1.16	4,412	39.6	316 .19	235 .26	452 .22	352 .80
						-26 %		-22 %
9 Local	366,943	1.16	12,736	28.8	851 .37	630 .72	936 .80	728 .68
						-26 %		-22 %
Subtotal (kg)	2,477,739		56,371	44.0	4,342 .84	3,274 .25	7,368 .19	5,736 .39
(tons)					4 .79	3 .61	8 .12	6 .32
Small Urban								
12 Other Fwy/Ex	236,782	1 19	3,643	65.0	414 .54	326 54	904 32	709 .41
						-21 %		-22 %
14 Prin. Arterial	353,027	1.15	6,258	56.4	540 .74	413 .09	1,130 .80	885 .50
						-24 %		-22 %

2007 VMT, VOC and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2007 VMT	1999 - 2007 Growth	2007 VHT	2007 Speed (mph)	2007 Baseline	2007 Control Strategy	2007 Baseline	2007 Control Strategy
16 Minor Arterial	200,944	1 15	6,690	30.0	452 .47	333 .72 -26 %	482 .21	378 .44 -22 %
17 Collector	106,572	1.15	4,095	26.0	268 .63	198 .11 -26 %	253 .77	199 .09 -22 %
19 Local	109,532	1.15	4,641	23.6	297 .79	220 .45 -26 %	261 .97	204 .90 -22 %
Subtotal (kg) (tons)	1,006,857		25,326	39.8	1,974 .17 2 .18	1,491 .91 1 .64	3,033 .07 3 .34	2,377 .34 2 .62
Urban								
14 Prin. Arterial	7,530	1.15	248	30.4	16 .76	12 .44 -26 %	20 .07	15 .58 -22 %
16 Minor Arterial	51,681	1.15	2,455	21.1	154 .10	113 .92 -26 %	118 .84	93 .28 -22 %
17 Collector	38,716	1.15	2,516	15.4	149 .43	106 .75 -29 %	100 .46	77 .81 -23 %
19 Local	15,727	1.15	1,286	12.2	72 .08	50 .16 -30 %	38 .43	30 .03 -22 %
Subtotal (kg) (tons)	113,654		6,505	17 5	392 .37 0 .43	283 .27 0 .31	277 .80 0 .31	216 .70 0 .24
Fayette County Totals (kg) (tons)	3,598,250		88,202	40.8	6,709 .38 7 .40	5,049 .43 5 .57	10,679 .06 11 .77	8,330 .43 9 .18
with Tier 2 Credits						4,851 .32 5 .35		7,284 .87 8 .03
Washington County								
Rural								
1 Interstate	1,509,343	1.22	23,242	64.9	2,199 .57	1,379 .50 -37 %	7,656 .25	5,366 .86 -30 %
2 Other Prin. Arterial	443,773	1.16	7,611	58.3	594 .90	352 .75 -41 %	1,453 .98	1,019 .28 -30 %
6 Minor Arterial	746,378	1 16	15,411	48.4	991 .07	577 .12 -42 %	1,826 .93	1,283 .89 -30 %
7 Major Collector	613,968	1.16	15,702	39.1	960 .14	547 .00 -43 %	1,399 .47	982 .36 -30 %
8 Minor Collector	254,002	1.16	6,447	39.4	396 .18	227 .66 -43 %	605 .41	425 .82 -30 %
9 Local	553,814	1.16	19,154	28.9	1,102 .60	629 .39 -43 %	1,304 .22	915 .87 -30 %
Subtotal (kg) (tons)	4,121,278		87,567	47.1	6,244 .46 6 .88	3,713 .42 4 .09	14,246 .26 15 .70	9,994 .08 11 .02
Urban								
11 Interstate	1,544,525	1.19	24,104	64.1	2,232 .68	1,387 .58 -38 %	7,387 .84	5,182 .27 -30 %
12 Other Fwy/Ex	52,395	1.19	819	64.0	75 .29	44 .74	192 .36	134 .36

2007 VMT, VOC, and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2007 VMT	1999 - 2007 Growth	2007 VHT	2007 Speed (mph)	2007 Baseline	2007 Control Strategy	2007 Baseline	2007 Control Strategy
						-41 %		-30 %
14 Prin. Arterial	618,330	1.15	21,741	28.4	1,243.20	691.93	1,315.23	920.31
						-44 %		-30 %
16 Minor Arterial	849,925	1.15	41,019	20.7	2,191.83	1,221.08	1,794.83	1,252.47
						-44 %		-30 %
17 Collector	336,299	1.15	21,352	15.8	1,101.28	587.73	725.88	505.87
						-47 %		-30 %
19 Local	450,386	1.15	41,906	10.7	1,972.38	1,029.57	1,073.11	746.48
						-48 %		-30 %
Subtotal (kg)	3,851,860		150,940	25.5	8,816.66	4,962.63	12,489.25	8,741.76
(tons)					9.72	5.47	13.77	9.64
Washington County Totals (kg)	7,973,138		238,507	33.4	15,061.12	8,676.05	26,735.51	18,735.84
(tons)					16.60	9.56	29.47	20.65
with Tier 2 Credits						8,286.87		16,695.13
						9.13		18.40
Westmoreland County								
Rural								
1 Interstate	955,812	1.22	14,723	64.9	1,402.44	909.28	5,870.02	4,118.60
						-35 %		-30 %
2 Other Prin. Arterial	1,287,323	1.16	22,997	56.0	1,702.86	1,006.68	3,973.42	2,793.16
						-41 %		-30 %
6 Minor Arterial	1,083,481	1.16	22,552	48.0	1,469.44	860.70	2,711.18	1,909.71
						-41 %		-30 %
7 Major Collector	633,126	1.16	16,303	38 8	1,009.86	578.03	1,460.44	1,027.23
						-43 %		-30 %
8 Minor Collector	234,308	1.16	5,936	39.5	370.03	214.39	570.80	402.61
						-42 %		-29 %
9 Local	716,214	1.16	26,212	27.3	1,511.29	861.89	1,667.55	1,171.43
						-43 %		-30 %
Subtotal (kg)	4,910,264		108,721	45.2	7,465.92	4,430.97	16,253.41	11,422.74
(tons)					8.23	4 88	17.92	12.59
Small Urban								
12 Other Fwy/Ex	122,947	1.19	1,892	65.0	183.69	111.29	495.10	347.06
						-39 %		-30 %
14 Prin Arterial	135,887	1.15	2,453	55.4	177.89	103.93	389.31	273.31
						-42 %		-30 %
16 Minor Arterial	292,687	1.15	10,197	28.7	595.28	332.85	639.43	448.27
						-44 %		-30 %
17 Collector	168,493	1.15	6,647	25.3	376.69	212.43	377.90	265.13
						-44 %		-30 %
19 Local	83,771	1.15	3,565	23.5	198 66	109.36	166.77	116.69
						-45 %		-30 %
Subtotal (kg)	803,785		24,754	32.5	1,532.21	869.86	2,068.51	1,450.46

2007 VMT, VOC, and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2007 VMT	1999 - 2007 Growth	2007 VHT	2007 Speed (mph)	2007 Baseline	2007 Control Strategy	2007 Baseline	2007 Control Strategy
(tons)					1.69	0.96	2.28	1.60
Urban								
11 Interstate	1,768,728	1.19	27,345	64.7	2,600.81	1,655.29	9,696.96	6,805.75
						-36 %		-30 %
12 Other Fwy/Ex	703,740	1.19	11,072	63.6	1,025.59	614.59	2,555.26	1,792.02
						-40 %		-30 %
14 Prin. Arterial	1,553,891	1.15	59,447	26.1	3,400.14	1,906.08	3,423.73	2,401.54
						-44 %		-30 %
16 Minor Arterial	1,194,922	1.15	59,359	20.1	3,213.50	1,798.25	2,570.17	1,800.96
						-44 %		-30 %
17 Collector	950,062	1.15	64,345	14.8	3,329.82	1,777.30	2,126.50	1,484.90
						-47 %		-30 %
19 Local	848,911	1.15	98,194	8.6	4,442.33	2,304.92	2,097.10	1,462.37
						-48 %		-30 %
Subtotal (kg)	7,020,254		319,762	22.0	18,012.19	10,056.43	22,469.72	15,747.54
(tons)					19.86	11.09	24.77	17.36
Westmoreland County								
Totals (kg)	12,734,303		453,237	28.1	27,010.32	15,357.26	40,791.64	28,620.74
(tons)					29.77	16.93	44.97	31.55
with Tier 2 Credits						14,733.60		25,350.32
						16.24		27.94
Summary Total								
Pittsburgh Area	70,118,544		2,989,657	23.5	162,319.89	92,639.98	192,042.10	135,711.09
Totals (kg)						102.12		149.60
(tons)								
						89,101.92		117,136.04
with Tier 2 Credits						98.22		129.12

2011 VMT, VOC and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2011 VMT	1999 - 2011 Growth	2011 VHT	2011 Speed (mph)	2011 Baseline	2011 Control Strategy	2011 Baseline	2011 Control Strategy
Allegheny County								
Rural								
2 Other Prin. Arterial	165,244	1.25	2,899	57.0	202 .71	112 .31	509 .50	326 .17
						-45 %		-36 %
6 Minor Arterial	154,502	1.25	3,165	48.8	190 .38	102 .59	351 .55	227 .18
						-46 %		-35 %
7 Major Collector	88,648	1.25	2,254	39.3	129 .80	69 .26	201 .95	130 .49
						-47 %		-35 %
8 Minor Collector	23,961	1.25	605	39.6	34 .86	18 .62	54 .16	34 .98
						-47 %		-35 %
9 Local	88,736	1.25	3,093	28.7	167 .03	88 .67	198 .87	128 .20
						-47 %		-36 %
Subtotal (kg)	521,091		12,015	43.4	724 .78	391 .45	1,316 .03	847 .02
(tons)					0 .80	0 .43	1 .45	0 .93
Urban								
11 Interstate	7,368,473	1.29	348,905	21.1	18,042 .25	9,486 .95	18,706 .05	11,887 .33
						-47 %		-36 %
12 Other Fwy/Ex	3,198,617	1.29	63,770	50.2	4,097 .02	2,208 .22	8,231 .12	5,305 .03
						-46 %		-36 %
14 Prin Arterial	9,286,700	1.23	367,197	25.3	19,380 .24	10,043 .92	19,208 .85	12,450 .08
						-48 %		-35 %
16 Minor Arterial	7,371,631	1.23	434,186	17.0	21,598 .09	10,716 .94	15,014 .57	9,724 .43
						-50 %		-35 %
17 Collector	2,907,299	1.23	293,686	9.9	12,879 91	6,082 .99	6,409 .68	4,121 .63
						-53 %		-36 %
19 Local	4,078,164	1.23	585,083	7.0	23,976 10	11,203 .41	9,637 .24	6,168 .26
						-53 %		-36 %
Subtotal (kg)	34,210,884		2,092,828	16.3	99,973 .61	49,742 .43	77,207 .51	49,656 .76
(tons)					110 .20	54 .83	85 .11	54 .74
Allegheny County Totals (kg)	34,731,975		2,104,843	16.5	100,698 .39	50,133 .88	78,523 .54	50,503 .78
(tons)					111 00	55 .26	86 .56	55 .67
with Tier 2 Credits						48,062 .07		37,106 .57
						52 .98		40 .90
Armstrong County								
Rural								
2 Other Prin. Arterial	594,398	1.25	10,255	58.0	883 .51	643 .94	2,052 .76	1,472 .18
						-27 %		-28 %
6 Minor Arterial	491,789	1 25	10,099	48.7	725 .69	515 .44	1,286 .51	931 .77
						-29 %		-28 %
7 Major Collector	261,453	1.25	6,573	39.8	449 .84	317 .34	692 .73	496 .44
						-29 %		-28 %
8 Minor Collector	164,437	1.25	4,159	39.5	284 .72	199 .68	416 .84	301 .90
						-30 %		-28 %

2011 VMT, VOC, and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2011 VMT	1999 - 2011 Growth	2011 VHT	2011 Speed (mph)	2011 Baseline	2011 Control Strategy	2011 Baseline	2011 Control Strategy
9 Local	285,603	1.25	9,841	29.0	631 .36	442 .15 -30 %	715 .74	516 .89 -28 %
Subtotal (kg) (tons)	1,797,680		40,928	43.9	2,975 .12 3 .28	2,118 .55 2 .34	5,164 .58 5 .69	3,719 .18 4 .10
Small Urban								
12 Other Fwy/Ex	72,581	1.29	1,117	65.0	118 .73	88 .79 -25 %	298 .58	212 .47 -29 %
14 Prin. Arterial	145,673	1.24	4,195	34.7	286 .36	199 .07 -30 %	364 .63	267 .39 -27 %
16 Minor Arterial	225,002	1.24	7,953	28.3	510 .55	353 .09 -31 %	499 .76	371 .17 -26 %
17 Collector	64,868	1.24	2,465	26.3	155 .44	108 .12 -30 %	148 .01	109 .16 -26 %
19 Local	69,089	1.24	2,935	23.5	180 .85	126 .17 -30 %	161 .91	118 .25 -27 %
Subtotal (kg) (tons)	577,213		18,665	30.9	1,251 .93 1 .38	875 .24 0 .96	1,472 .89 1 .62	1,078 .44 1 .19
Urban								
14 Prin. Arterial	5,954	1.24	195	30.5	12 .67	8 82 -30 %	14 26	10 .38 -27 %
17 Collector	5,809	1.24	345	16.8	20 .12	13 .57 -33 %	12 .86	9 .51 -26 %
Subtotal (kg) (tons)	11,763		540	21.8	32 .79 0 .04	22 .39 0 .02	27 .12 0 .03	19 .89 0 .02
Armstrong County Totals (kg) (tons)	2,386,656		60,134	39.7	4,259 .84 4 .70	3,016 .18 3 .32	6,664 .59 7 .35	4,817 .51 5 .31
with Tier 2 Credits						2,876 .68 3 .17		3,800 .50 4 .19
Beaver County								
Rural								
1 Intersate	303,718	1.35	4,674	65.0	442 .58	270 .29 -39 %	1,714 .72	1,065 .34 -38 %
2 Other Prin. Arterial	177,317	1.25	3,067	57.8	239 .34	134 .84 -44 %	592 .46	385 .90 -35 %
6 Minor Arterial	453,383	1.25	9,345	48.5	611 .95	336 .82 -45 %	1,122 .24	738 .45 -34 %
7 Major Collector	231,316	1.25	5,855	39.5	366 .44	199 .83 -45 %	565 .88	372 .69 -34 %
8 Minor Collector	90,327	1 25	2,286	39.5	143 .01	77 .61 -46 %	217 .19	143 .30 -34 %
9 Local	250,337	1.25	8,633	29.0	506 10	271 .30 -46 %	581 47	383 .10 -34 %
Subtotal (kg)	1,506,398		33,859	44.5	2,309 .42	1,290 .69	4,793 .96	3,088 .78

2011 VMT, VOC and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2011 VMT	1999 - 2011 Growth	2011 VHT	2011 Speed (mph)	2011 Baseline	2011 Control Strategy	2011 Baseline	2011 Control Strategy
(tons)					2.55	1.42	5.28	3.40
Urban								
11 Interstate	240,147	1.29	3,695	65.0	351.16	214.75	1,371.13	851.06
						-39 %		-38 %
12 Other Fwy/Ex	863,781	1.29	13,522	63.9	1,257.66	712.09	3,179.27	2,074.83
						-43 %		-35 %
14 Prin. Arterial	1,290,814	1.24	44,234	29.2	2,601.40	1,379.51	2,891.55	1,914.70
						-47 %		-34 %
16 Minor Arterial	736,543	1.24	36,589	20.1	1,996.73	1,052.73	1,586.97	1,048.83
						-47 %		-34 %
17 Collector	495,302	1.24	32,245	15.4	1,692.10	852.70	1,110.29	730.16
						-50 %		-34 %
19 Local	557,551	1.24	63,257	8 8	2,879.84	1,392.68	1,337 70	876.49
						-52 %		-34 %
Subtotal (kg)	4,184,138		193,541	21.6	10,778.89	5,604.46	11,476.91	7,496.07
(tons)					11.88	6.18	12.65	8.26
Beaver County Totals (kg)	5,690,536		227,400	25.0	13,088.31	6,895.15	16,270.87	10,584.85
(tons)					14.43	7.60	17.94	11.67
with Tier 2 Credits						6,560.51		8,418.84
						7.23		9.28
Butler County								
Rural								
1 Interstate	1,040,345	1.35	16,040	64.9	1,468.15	1,078.67	4,851.18	3,188.66
						-27 %		-34 %
2 Other Prin. Arterial	933,168	1.25	16,683	55.9	1,189 24	837.67	2,865.53	1,971.17
						-30 %		-31 %
6 Minor Arterial	1,142,841	1.25	24,490	46.7	1,524.81	1,048.59	2,661.95	1,855.73
						-31 %		-30 %
7 Major Collector	613,072	1.25	15,532	39.5	932.64	635.57	1,383.38	967.44
						-32 %		-30 %
8 Minor Collector	124,937	1.25	3,149	39.7	189.57	130.16	298.01	206.67
						-31 %		-31 %
9 Local	527,711	1 25	18,184	29.0	1,029.27	700.39	1,236.22	855.09
						-32 %		-31 %
Subtotal (kg)	4,382,074		94,078	46.6	6,333.68	4,431.05	13,296.27	9,044.76
(tons)					6.98	4.88	14.66	9.97
Small Urban								
12 Other Fwy/Ex	142,588	1.29	2,194	65.0	203.51	147.97	524.50	360.99
						-27 %		-31 %
14 Prin Arterial	398,951	1.24	7,403	53.9	505.18	351.51	1,021.47	721.26
						-30 %		-29 %
16 Minor Arterial	225,611	1.24	7,674	29.4	436.00	292.33	462.52	329.09
						-33 %		-29 %

2011 VMT, VOC, and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2011 VMT	1999 - 2011 Growth	2011 VHT	2011 Speed (mph)	2011 Baseline	2011 Control Strategy	2011 Baseline	2011 Control Strategy
17 Collector	111,776	1.24	4,325	25.8	238 .87	160 .13 -33 %	231 .34	163 .38 -29 %
19 Local	104,126	1.24	4,443	23.4	240 .41	162 .97 -32 %	234 .89	162 .84 -31 %
Subtotal (kg) (tons)	983,052		26,040	37.8	1,623 .97 1 .79	1,114 .91 1 .23	2,474 .72 2 .73	1,737 .56 1 .92
Urban								
11 Interstate	393,217	1.29	6,079	64.7	555 .08	406 .62 -27 %	1,830 .03	1,201 .96 -34 %
12 Other Fwy/Ex	59,907	1.29	936	64.0	84 .18	60 .86 -28 %	205 .64	142 .96 -30 %
14 Prin. Arterial	187,119	1.24	7,391	25.3	408 .18	275 .68 -32 %	420 .10	292 .08 -30 %
16 Minor Arterial	243,368	1.24	14,534	16.7	751 .74	488 .02 -35 %	529 .24	369 .13 -30 %
17 Collector	100,388	1.24	13,845	7.3	626 .17	374 .33 -40 %	233 .98	163 .75 -30 %
19 Local	118,672	1.24	9,783	12.1	468 .67	295 .11 -37 %	289 .43	197 .77 -32 %
Subtotal (kg) (tons)	1,102,671		52,568	21 0	2,894 .02 3 19	1,900 .62 2 .10	3,508 .42 3 .87	2,367 .65 2 .61
Butler County Totals (kg) (tons)	6,467,797		172,686	37 5	10,851 67 11 96	7,446 .58 8 .21	19,279 .41 21 .25	13,149 .97 14 .50
with Tier 2 Credits						7,074 .22 7 .80		10,435 .26 11 .50
Fayette County								
Rural								
2 Other Prin. Arterial	1,103,754	1.24	19,219	57.4	1,690 .10	1,235 .96 -27 %	3,782 .72	2,754 .15 -27 %
6 Minor Arterial	336,507	1.24	6,833	49.2	512 .93	368 .78 -28 %	930 .70	678 .13 -27 %
7 Major Collector	636,354	1.24	16,181	39.3	1,144 .99	808 .26 -29 %	1,607 .92	1,184 .15 -26 %
8 Minor Collector	187,349	1.24	4,731	39.6	335 .17	237 .40 -29 %	481 .74	353 .44 -27 %
9 Local	393,641	1.24	13,692	28.7	907 .11	640 .85 -29 %	999 .34	730 .70 -27 %
Subtotal (kg) (tons)	2,657,605		60,656	43.8	4,590 .30 5 .06	3,291 .25 3 .63	7,802 .42 8 .60	5,700 .57 6 .28
Small Urban								
12 Other Fwy/Ex	257,007	1.29	3,955	65.0	439 .47	330 .43 -25 %	970 .24	718 .99 -26 %
14 Prin. Arterial	376,815	1.22	6,735	55.9	567 .29	411 .28 -28 %	1,181 .74	871 .92 -26 %

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2011 VMT	1999 - 2011 Growth	2011 VHT	2011 Speed (mph)	2011 Baseline	2011 Control Strategy	2011 Baseline	2011 Control Strategy
16 Minor Arterial	214,485	1.22	7,197	29.8	482 .68	338 .52	511 .80	380 .95
						-30 %		-26 %
17 Collector	113,752	1.22	4,381	26.0	285 .77	200 .90	269 .87	200 .69
						-30 %		-26 %
19 Local	116,921	1.22	4,954	23.6	316 .44	223 .09	278 .35	205 .99
						-30 %		-26 %
Subtotal (kg)	1,078,980		27,223	39.6	2,091 .65	1,504 .22	3,212 .00	2,378 .54
(tons)					2 .31	1 .66	3 .54	2 .62
Urban								
14 Prin. Arterial	8,036	1.22	266	30.2	17 .83	12 .58	21 .28	15 .42
						-29 %		-28 %
16 Minor Arterial	55,160	1.22	2,652	20.8	165 .72	116 .84	126 .65	94 .30
						-29 %		-26 %
17 Collector	41,326	1.22	2,727	15.2	160 .70	108 .68	107 .29	77 .57
						-32 %		-28 %
19 Local	16,794	1.23	1,377	12.2	76 .80	50 .67	40 .98	30 .32
						-34 %		-26 %
Subtotal (kg)	121,316		7,022	17.3	421 .05	288 .77	296 .20	217 .61
(tons)					0 .46	0 .32	0 .33	0 .24
Fayette County								
Totals (kg)	3,857,901		94,901	40.7	7,103 .00	5,084 .24	11,310 .62	8,296 .72
(tons)					7 .83	5 .60	12 47	9 .15
with Tier 2 Credits						4,857 .55		6,644 .11
						5 .35		7 .32
Washington County								
Rural								
1 Interstate	1,661,931	1.35	25,623	64.9	2,368 .57	1,408 .76	8,322 .25	5,201 .18
						-41 %		-38 %
2 Other Prin. Arterial	475,983	1.24	8,198	58.1	626 .58	350 .47	1,537 .08	997 .31
						-44 %		-35 %
6 Minor Arterial	800,533	1.24	16,620	48.2	1,053 .12	575 .61	1,940 .08	1,268 .57
						-45 %		-35 %
7 Major Collector	658,506	1 24	16,911	38.9	1,024 .63	548 .59	1,493 .59	981 .24
						-46 %		-34 %
8 Minor Collector	272,408	1.24	6,926	39.3	420 .96	227 .92	645 .93	423 .12
						-46 %		-34 %
9 Local	594,176	1.24	20,561	28.9	1,174 .31	631 .51	1,393 .25	910 .02
						-46 %		-35 %
Subtotal (kg)	4,463,537		94,840	47.1	6,668 .17	3,742 .86	15,332 .18	9,781 .44
(tons)					7 35	4 .13	16 .90	10 .78
Urban								
11 Interstate	1,676,439	1.29	26,396	63.5	2,356 .85	1,389 .83	7,823 .71	4,918 .70
						-41 %		-37 %
12 Other Fwy/Ex	56,871	1.29	889	64.0	80 .17	45 .01	206 .95	134 .19

2011 VMT, VOC, and NOX Emissions by County by Functional Class

	VMT/ VHT				VOC (kg/day)		Nox (kg/day)	
	2011 VMT	1999 - 2011 Growth	2011 VHT	2011 Speed (mph)	2011 Baseline	2011 Control Strategy	2011 Baseline	2011 Control Strategy
						-44 %		-35 %
14 Prin. Arterial	661,607	1.23	23,627	28.0	1,342 .55	700 .11	1,401 .83	924 .23
						-48 %		-34 %
16 Minor Arterial	909,411	1.23	44,387	20.5	2,364 .33	1,239 .09	1,921 .22	1,260 .42
						-48 %		-34 %
17 Collector	359,831	1.23	23,150	15.5	1,188 .43	592 .18	777 .21	508 .40
						-50 %		-35 %
19 Local	481,894	1.23	45,921	10.5	2,138 .72	1,041 .06	1,149 .34	745 .80
						-51 %		-35 %
Subtotal (kg)	4,146,053		164,370	25.2	9,471 .05	5,007 .28	13,280 .26	8,491 .74
(tons)					10 .44	5 .52	14 .64	9 .36
Washington County Totals (kg)	8,609,590		259,209	33.2	16,139 .22	8,750 .14	28,612 .44	18,273 .18
(tons)					17 .79	9 .65	31 .54	20 .14
with Tier 2 Credits						8,256 .69		15,074 .71
						9 .10		16 .62
Westmoreland County								
Rural								
1 Interstate	1,052,427	1.35	16,234	64.8	1,502 .96	930 .80	6,369 03	3,916 11
						-38 %		-39 %
2 Other Prin. Arterial	1,380,735	1.24	24,932	55 4	1,801 .25	999 .74	4,169 .63	2,723 .94
						-44 %		-35 %
6 Minor Arterial	1,162,110	1.24	24,333	47.8	1,567 86	858 .78	2,881 .48	1,888 .98
						-45 %		-34 %
7 Major Collector	679,037	1.24	17,577	38.6	1,082 .28	578 .19	1,557 .52	1,027 .50
						-47 %		-34 %
8 Minor Collector	251,305	1.24	6,376	39.4	394 .97	213 .81	609 .40	399 .46
						-46 %		-34 %
9 Local	768,280	1.24	28,537	26.9	1,634 .99	873 .87	1,781 .76	1,170 .37
						-47 %		-34 %
Subtotal (kg)	5,293,894		117,990	44 9	7,984 .31	4,455 .19	17,368 .82	11,126 .36
(tons)					8 .80	4 .91	19 .15	12 .26
Small Urban								
12 Other Fwy/Ex	133,451	1.29	2,053	65.0	196 .01	112 .09	532 .29	343 .03
						-43 %		-36 %
14 Prin. Arterial	145,401	1.23	2,656	54.8	189 .02	103 .64	406 .89	267 .99
						-45 %		-34 %
16 Minor Arterial	313,180	1.23	11,115	28.2	643 .89	337 82	681 .59	450 .64
						-48 %		-34 %
17 Collector	180,290	1.23	7,166	25.2	404 .99	214 .42	402 .96	265 .27
						-47 %		-34 %
19 Local	89,662	1.23	3,816	23.5	212 .32	109 .89	178 47	119 .04
						-48 %		-33 %
Subtotal (kg)	861,984		26,805	32.2	1,646 .23	877 .86	2,202 .20	1,445 .97

2011 VMT, VOC and NOX Emissions by County by Functional Class

	VMT / VHT				VOC (kg/day)		Nox (kg/day)	
	2011 VMT	1999 - 2011 Growth	2011 VHT	2011 Speed (mph)	2011 Baseline	2011 Control Strategy	2011 Baseline	2011 Control Strategy
(tons)					1 .81	0 .97	2 .43	1 .59
Urban								
11 Interstate	1,919,811	1.29	29,755	64.5	2,757 .23	1,665 .81	10,362 .80	6,439 .71
						-40 %		-38 %
12 Other Fwy/Ex	763,836	1.29	12,063	63.3	1,093 .03	613 .43	2,735 .92	1,782 .75
						-44 %		-35 %
14 Prin. Arterial	1,662,626	1.23	66,145	25.1	3,742 .04	1,967 .93	3,647 .43	2,406 .42
						-47 %		-34 %
16 Minor Arterial	1,278,552	1.23	64,674	19.8	3,486 .52	1,827 .48	2,749 .27	1,808 .70
						-48 %		-34 %
17 Collector	1,016,555	1.23	70,448	14.4	3,625 .14	1,799 .76	2,277 .53	1,492 .52
						-50 %		-34 %
19 Local	908,355	1 23	113,132	8.0	5,028 .12	2,427 .10	2,270 .22	1,477 .49
						-52 %		-35 %
Subtotal (kg)	7,549,735		356,218	21.2	19,732 .08	10,301 .51	24,043 .17	15,407 .59
(tons)					21 .75	11 .36	26 .50	16 .98
Westmoreland County Totals (kg)	13,705,613		501,012	27.4	29,362 .62	15,634 .56	43,614 .19	27,979 .92
(tons)					32 .37	17 .23	48 .08	30 .84
with Tier 2 Credits						14,844 .85		22,862 .60
						16 .36		25 .20
Summary Total								
Pittsburgh Area Totals (kg)	75,450,068		3,420,184	22.1	181,503 .05	96,960 .73	204,275 .66	133,605 .93
(tons)						106 .88		147 .28
						92,532 .57		104,342 .59
with Tier 2 Credits						102 .00		115 .02

VMT, VOC, CO and Nox Inventory and Forecast Emissions by County by Vehicle Type

VMT, VOC, CO, and NOX Inventory and Forecast By County By Vehicle Type
1999 with Control Strategy

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Allegheny	LDGV	17,824,175	64.2%		26,780	55.7%	205,115	52.5%	25,227	42.6%
	LDGT1	5,357,021	19.3%		10,417	21.7%	90,169	23.1%	10,113	17.1%
	LDGT2	2,464,668	8.9%		5,393	11.2%	50,395	12.9%	4,878	8.2%
	HDGV	595,918	2.1%		2,186	4.5%	27,647	7.1%	3,245	5.5%
	LDDV	55,283	0.2%		31	0.1%	81	0.0%	79	0.1%
	LDDT	27,765	0.1%		23	0.0%	48	0.0%	49	0.1%
	HDDV	1,250,354	4.5%		2,134	4.4%	11,645	3.0%	15,436	26.1%
	MC	196,635	0.7%		1,148	2.4%	5,590	1.4%	182	0.3%
	Total	27,771,819		20.9	48,113		390,690		59,209	
				Total Tons:	(53.04)		(430.66)		(65.27)	
				with Tier 2 Credits:	48,113				59,209	
					(53.04)				(65.27)	

	Kg	Ton	Pct.
Exhaust:	31,537	34.76	65.5%
Evaporative:	5,029	5.54	10.5%
Refueling:	0	0.00	0.0%
Running Loss:	9,610	10.59	20.0%
Resting Loss:	1,938	2.14	4.0%
	48,113		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Armstrong	LDGV	1,199,297	62.9%		1,688	52.7%	15,103	50.6%	2,290	43.2%
	LDGT1	360,497	18.9%		724	22.6%	7,129	23.9%	912	17.2%
	LDGT2	165,707	8.7%		405	12.7%	4,271	14.3%	463	8.7%
	HDGV	52,495	2.8%		178	5.6%	2,442	8.2%	321	6.1%
	LDDV	3,810	0.2%		1	0.0%	3	0.0%	6	0.1%
	LDDT	1,913	0.1%		1	0.0%	2	0.0%	4	0.1%
	HDDV	110,235	5.8%		132	4.1%	673	2.3%	1,286	24.3%
	MC	13,384	0.7%		74	2.3%	224	0.7%	15	0.3%
	Total	1,907,338		41.0	3,204		29,847		5,296	
				Total Tons:	(3.53)		(32.90)		(5.84)	
				with Tier 2 Credits:	3,204				5,296	
					(3.53)				(5.84)	

	Kg	Ton	Pct.
Exhaust:	2,253	2.48	70.3%
Evaporative:	474	0.52	14.8%
Refueling:	0	0.00	0.0%
Running Loss:	332	0.37	10.3%
Resting Loss:	147	0.16	4.6%
	3,204		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Beaver	LDGV	2,846,128	63.0%		4,055	53.0%	32,637	48.2%	4,735	39.6%
	LDGT1	855,344	18.9%		1,595	20.9%	14,841	21.9%	1,863	15.6%
	LDGT2	393,177	8.7%		958	12.5%	9,988	14.8%	975	8.1%
	HDGV	122,830	2.7%		478	6.2%	7,273	10.7%	745	6.2%
	LDDV	8,984	0.2%		5	0.1%	12	0.0%	14	0.1%
	LDDT	4,507	0.1%		3	0.0%	7	0.0%	9	0.1%
	HDDV	257,289	5.7%		366	4.8%	2,070	3.1%	3,593	30.0%
	MC	31,302	0.7%		187	2.4%	841	1.2%	33	0.3%
	Total	4,519,561		26.5	7,647		67,668		11,968	
				Total Tons.	(8.43)		(74.59)		(13.19)	
				with Tier 2 Credits:	7,647				11,968	

VMT, VOC, CO, and NOX Inventory and Forecast By County By Vehicle Type
1999 with Control Strategy

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
					(8.43)				(13.19)	
		Kg	Ton	Pct.						
	Exhaust:	5,093	5.61	66.6%						
	Evaporative:	959	1.06	12.5%						
	Refueling:	0	0.00	0.0%						
	Running Loss:	1,254	1.38	16.4%						
	Resting Loss:	341	0.38	4.5%						
		7,647								
Butler	LDGV	3,142,422	61.6%		3,905	50.2%	37,091	47.2%	5,293	35.5%
	LDGT1	944,736	18.5%		1,771	22.8%	19,030	24.2%	2,271	15.2%
	LDGT2	434,613	8.5%		1,001	12.9%	11,655	14.8%	1,170	7.8%
	HDGV	170,804	3.3%		479	6.2%	7,652	9.7%	1,044	7.0%
	LDDV	10,128	0.2%		4	0.0%	10	0.0%	16	0.1%
	LDDT	5,086	0.1%		3	0.0%	6	0.0%	10	0.1%
	HDDV	358,054	7.0%		426	5.5%	2,428	3.1%	5,071	34.0%
	MC	34,991	0.7%		186	2.4%	734	0.9%	42	0.3%
	Total	5,100,834		39.2	7,775		78,605		14,916	
				Total Tons:	(8.57)		(86.65)		(16.44)	
				with Tier 2 Credits:	7,775				14,916	
					(8.57)				(16.44)	
		Kg	Ton	Pct.						
	Exhaust:	5,528	6.09	71.1%						
	Evaporative:	1,084	1.19	13.9%						
	Refueling:	0	0.00	0.0%						
	Running Loss:	819	0.90	10.5%						
	Resting Loss:	344	0.38	4.4%						
		7,775								
Fayette	LDGV	1,968,050	63.3%		2,988	53.2%	28,001	50.9%	4,107	45.3%
	LDGT1	591,548	19.0%		1,300	23.1%	13,611	24.7%	1,617	17.8%
	LDGT2	271,902	8.7%		727	13.0%	8,115	14.7%	828	9.1%
	HDGV	79,234	2.5%		275	4.9%	3,841	7.0%	485	5.3%
	LDDV	6,221	0.2%		2	0.0%	6	0.0%	10	0.1%
	LDDT	3,111	0.1%		2	0.0%	4	0.0%	6	0.1%
	HDDV	165,698	5.3%		201	3.6%	1,045	1.9%	1,994	22.0%
	MC	21,741	0.7%		119	2.1%	398	0.7%	26	0.3%
	Total	3,107,505		41.0	5,614		55,020		9,074	
				Total Tons:	(6.19)		(60.65)		(10.00)	
				with Tier 2 Credits:	5,614				9,074	
					(6.19)				(10.00)	
		Kg	Ton	Pct.						
	Exhaust:	3,989	4.40	71.1%						
	Evaporative:	821	0.90	14.6%						
	Refueling:	0	0.00	0.0%						
	Running Loss:	558	0.61	9.9%						
	Resting Loss:	247	0.27	4.4%						
		5,614								
Washington	LDGV	4,125,664	60.8%		5,048	51.1%	42,843	45.3%	7,235	33.4%
	LDGT1	1,240,145	18.3%		2,035	20.6%	20,591	21.8%	2,881	13.3%

VMT, VOC, CO, and NOX Inventory and Forecast By County By Vehicle Type
1999 with Control Strategy

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
	LDGT2	570,510	8.4%		1,110	11.2%	12,426	13.1%	1,454	6.7%
	HDGV	253,065	3.7%		793	8.0%	13,627	14.4%	1,633	7.5%
	LDDV	13,404	0.2%		6	0.1%	15	0.0%	23	0.1%
	LDDT	6,744	0.1%		4	0.0%	9	0.0%	14	0.1%
	HDDV	530,316	7.8%		636	6.4%	3,852	4.1%	8,361	38.6%
	MC	45,734	0.7%		251	2.5%	1,188	1.3%	54	0.3%
	Total	6,785,582		33.8	9,884		94,551		21,656	
				Total Tons:	(10.90)		(104.22)		(23.87)	
				with Tier 2 Credits:	9,884				21,656	
					(10.90)				(23.87)	

	Kg	Ton	Pct.
Exhaust:	6,634	7.31	67.1%
Evaporative:	1,461	1.61	14.8%
Refueling:	0	0.00	0.0%
Running Loss:	1,316	1.45	13.3%
Resting Loss:	474	0.52	4.8%
	9,884		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Westmoreland	LDGV	6,684,243	61.3%		8,868	51.5%	71,684	46.0%	11,358	34.4%
	LDGT1	2,009,325	18.4%		3,663	21.3%	34,920	22.4%	4,587	13.9%
	LDGT2	924,181	8.5%		2,047	11.9%	21,654	13.9%	2,325	7.0%
	HDGV	383,122	3.5%		1,183	6.9%	19,344	12.4%	2,388	7.2%
	LDDV	21,479	0.2%		10	0.1%	26	0.0%	35	0.1%
	LDDT	10,799	0.1%		8	0.0%	16	0.0%	22	0.1%
	HDDV	804,032	7.4%		1,027	6.0%	6,098	3.9%	12,261	37.1%
	MC	73,907	0.7%		428	2.5%	1,928	1.2%	82	0.2%
	Total	10,911,088		29.3	17,234		155,669		33,058	
				Total Tons:	(19.00)		(171.60)		(36.44)	
				with Tier 2 Credits.	17,234				33,058	
					(19.00)				(36.44)	

	Kg	Ton	Pct.
Exhaust:	11,524	12.70	66.9%
Evaporative:	2,336	2.57	13.6%
Refueling:	0	0.00	0.0%
Running Loss:	2,608	2.87	15.1%
Resting Loss:	766	0.84	4.4%
	17,234		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
All Areas	LDGV	37,789,979	62.9%		53,332	53.6%	432,473	49.6%	60,246	38.8%
	LDGT1	11,358,616	18.9%		21,506	21.6%	200,291	23.0%	24,243	15.6%
	LDGT2	5,224,758	8.7%		11,642	11.7%	118,503	13.6%	12,093	7.8%
	HDGV	1,657,468	2.8%		5,572	5.6%	81,826	9.4%	9,861	6.4%
	LDDV	119,309	0.2%		58	0.1%	153	0.0%	183	0.1%
	LDDT	59,925	0.1%		45	0.0%	92	0.0%	113	0.1%
	HDDV	3,475,978	5.8%		4,922	4.9%	27,811	3.2%	48,002	30.9%
	MC	417,694	0.7%		2,394	2.4%	10,903	1.3%	434	0.3%
	Total	60,103,727		25.8	99,472		872,051		155,176	
				Total Tons:	(109.65)		(961.27)		(171.05)	
				with Tier 2 Credits.	99,472				155,176	
					(109.65)				(171.05)	

VMT, VOC, CO, and NOX Inventory and Forecast By County By Vehicle Type
1999 with Control Strategy

County	VMT		Speed	VOC		CO		NOx	
	Miles	Pct.	(mph)	Kilograms	Pct.	Kilograms	Pct.	Kilograms	Pct.
	Kg	Ton	Pct.						
Exhaust:	66,557	73.37	66.9%						
Evaporative:	12,162	13.41	12.2%						
Refueling:	0	0.00	0.0%						
Running Loss:	16,496	18.18	16.6%						
Resting Loss:	4,256	4.69	4.3%						
	99,472								

VMT, VOC, CO, and NOX Inventory and Forecast By County By Vehicle Type
2007 with Control Strategy

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Allegheny	LDGV	20,734,023	64.2%		25,513	54.8%	215,245	55.7%	23,620	46.1%
	LDGT1	6,231,580	19.3%		9,876	21.2%	87,310	22.6%	9,142	17.8%
	LDGT2	2,867,017	8.9%		5,060	10.9%	43,996	11.4%	4,948	9.7%
	HDGV	697,006	2.2%		2,006	4.3%	17,467	4.5%	3,089	6.0%
	LDDV	64,323	0.2%		31	0.1%	94	0.0%	74	0.1%
	LDDT	32,314	0.1%		23	0.0%	54	0.0%	44	0.1%
	HDDV	1,462,458	4.5%		2,694	5.8%	14,801	3.8%	10,107	19.7%
	MC	229,091	0.7%		1,383	3.0%	7,141	1.8%	199	0.4%
	Total	32,317,812		18.0	46,586		386,106		51,223	
				Total Tons:	(51.35)		(425.61)		(56.46)	
				with Tier 2 Credits:	44,968				42,738	
					(49.57)				(47.11)	

	Kg	Ton	Pct.
Exhaust:	32,088	35.37	68.9%
Evaporative:	4,214	4.65	9.0%
Refueling:	0	0.00	0.0%
Running Loss:	9,101	10.03	19.5%
Resting Loss:	1,184	1.30	2.5%
	46,586		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Armstrong	LDGV	1,396,082	62.9%		1,565	52.9%	13,413	53.6%	2,234	46.2%
	LDGT1	419,643	18.9%		656	22.2%	5,931	23.7%	879	18.2%
	LDGT2	192,894	8.7%		364	12.3%	3,433	13.7%	499	10.3%
	HDGV	61,137	2.8%		134	4.5%	1,214	4.9%	323	6.7%
	LDDV	4,439	0.2%		1	0.0%	4	0.0%	5	0.1%
	LDDT	2,221	0.1%		1	0.0%	2	0.0%	3	0.1%
	HDDV	128,390	5.8%		148	5.0%	767	3.1%	879	18.2%
	MC	15,589	0.7%		86	2.9%	259	1.0%	17	0.4%
	Total	2,220,395		40.4	2,956		25,022		4,840	
				Total Tons:	(3.26)		(27 58)		(5.34)	
				with Tier 2 Credits:	2,834				4,197	
					(3.12)				(4.63)	

	Kg	Ton	Pct.
Exhaust:	2,151	2.37	72.8%
Evaporative:	400	0.44	13.5%
Refueling:	0	0.00	0.0%
Running Loss:	311	0.34	10.5%
Resting Loss:	94	0.10	3.2%
	2,956		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Beaver	LDGV	3,324,729	62.9%		3,610	53.1%	30,297	53.1%	4,561	42.8%
	LDGT1	999,183	18.9%		1,387	20.4%	12,394	21.7%	1,732	16.3%
	LDGT2	459,295	8.7%		792	11.6%	7,088	12.4%	1,018	9.6%
	HDGV	144,707	2.7%		367	5.4%	3,798	6.7%	759	7.1%
	LDDV	10,497	0.2%		4	0.1%	12	0.0%	13	0.1%
	LDDT	5,272	0.1%		3	0.0%	7	0.0%	8	0.1%
	HDDV	303,123	5.7%		419	6.2%	2,419	4.2%	2,526	23.7%
	MC	36,552	0.7%		220	3.2%	1,018	1.8%	38	0.4%
	Total	5,283,358		25.5	6,802		57,034		10,656	
				Total Tons:	(7.50)		(62.87)		(11.75)	
				with Tier 2 Credits:	6,540				9,282	

VMT, VOC, CO, and NOX Inventory and Forecast By County By Vehicle Type
2007 with Control Strategy

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
					(7.21)				(10.23)	
		Kg	Ton	Pct.						
	Exhaust:	4,735	5.22	69.6%						
	Evaporative:	791	0.87	11.6%						
	Refueling:	0	0.00	0.0%						
	Running Loss:	1,069	1.18	15.7%						
	Resting Loss:	208	0.23	3.1%						
		6,802								
Butler	LDGV	3,688,004	61.6%		3,614	50.1%	33,216	50.4%	5,152	38.7%
	LDGT1	1,108,761	18.5%		1,608	22.3%	15,669	23.8%	2,187	16.4%
	LDGT2	510,076	8.5%		906	12.6%	9,210	14.0%	1,276	9.6%
	HDGV	202,017	3.4%		374	5.2%	4,150	6.3%	1,067	8.0%
	LDDV	11,895	0.2%		3	0.0%	10	0.0%	15	0.1%
	LDDT	5,980	0.1%		2	0.0%	6	0.0%	9	0.1%
	HDDV	423,483	7.1%		487	6.7%	2,818	4.3%	3,549	26.7%
	MC	41,072	0.7%		219	3.0%	863	1.3%	49	0.4%
	Total	5,991,288		38.3	7,213		65,943		13,305	
				Total Tons:	(7.95)		(72.69)		(14.67)	
				with Tier 2 Credits:	6,888				11,589	
					(7 59)				(12.77)	
		Kg	Ton	Pct.						
	Exhaust:	5,328	5.87	73.9%						
	Evaporative:	906	1.00	12.6%						
	Refueling:	0	0.00	0.0%						
	Running Loss:	761	0.84	10.6%						
	Resting Loss:	218	0.24	3.0%						
		7,213								
Fayette	LDGV	2,278,864	63.3%		2,718	53.8%	23,782	54.1%	3,981	47.8%
	LDGT1	684,971	19.0%		1,136	22.5%	10,542	24.0%	1,570	18.8%
	LDGT2	314,847	8.8%		630	12.5%	6,178	14.0%	891	10.7%
	HDGV	91,743	2.5%		201	4.0%	1,858	4.2%	488	5.9%
	LDDV	7,202	0.2%		2	0.0%	6	0.0%	9	0.1%
	LDDT	3,603	0.1%		2	0.0%	3	0.0%	5	0.1%
	HDDV	191,847	5.3%		224	4.4%	1,181	2.7%	1,357	16.3%
	MC	25,173	0.7%		138	2.7%	447	1.0%	29	0.4%
	Total	3,598,250		40.8	5,049		43,998		8,330	
				Total Tons:	(5.57)		(48.50)		(9.18)	
				with Tier 2 Credits:	4,851				7,285	
					(5.35)				(8.03)	
		Kg	Ton	Pct.						
	Exhaust:	3,714	4.09	73.6%						
	Evaporative:	658	0.73	13.0%						
	Refueling:	0	0.00	0.0%						
	Running Loss:	513	0.57	10.2%						
	Resting Loss:	164	0.18	3.2%						
		5,049								
Washington	LDGV	4,840,358	60.7%		4,398	50.7%	37,297	49.9%	6,936	37.0%
	LDGT1	1,454,989	18.2%		1,715	19.8%	15,778	21.1%	2,660	14.2%

VMT, VOC, CO, and NOX Inventory and Forecast By County By Vehicle Type
2007 with Control Strategy

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
	LDGT2	669,349	8.4%		923	10.6%	8,701	11.6%	1,494	8.0%
	HDGV	300,793	3.8%		610	7.0%	7,085	9.5%	1,675	8.9%
	LDDV	15,742	0.2%		5	0.1%	16	0.0%	22	0.1%
	LDDT	7,922	0.1%		4	0.0%	9	0.0%	13	0.1%
	HDDV	630,320	7.9%		726	8.4%	4,470	6.0%	5,874	31.3%
	MC	53,665	0.7%		295	3.4%	1,397	1.9%	64	0.3%
	Total	7,973,138		33.4	8,676		74,752		18,736	
				Total Tons:	(9.56)		(82.40)		(20.65)	
				with Tier 2 Credits:	8,287				16,695	
					(9.13)				(18.40)	

	Kg	Ton	Pct.
Exhaust:	6,083	6.71	70.1%
Evaporative:	1,186	1.31	13.7%
Refueling:	0	0.00	0.0%
Running Loss:	1,114	1.23	12.8%
Resting Loss:	293	0.32	3.4%
	8,676		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Westmoreland	LDGV	7,789,583	61.2%		7,890	51.4%	65,763	50.9%	10,831	37.8%
	LDGT1	2,341,603	18.4%		3,130	20.4%	27,991	21.7%	4,229	14.8%
	LDGT2	1,077,013	8.5%		1,709	11.1%	15,417	11.9%	2,396	8.4%
	HDGV	452,572	3.6%		933	6.1%	10,595	8.2%	2,421	8.5%
	LDDV	25,058	0.2%		9	0.1%	28	0.0%	33	0.1%
	LDDT	12,598	0.1%		7	0.0%	16	0.0%	20	0.1%
	HDDV	949,736	7.5%		1,176	7.7%	7,126	5.5%	8,595	30.0%
	MC	86,140	0.7%		503	3.3%	2,309	1.8%	95	0.3%
	Total	12,734,303		28.1	15,357		129,245		28,621	
				Total Tons.	(16.93)		(142.47)		(31.55)	
				with Tier 2 Credits:	14,734				25,350	
					(16.24)				(27.94)	

	Kg	Ton	Pct.
Exhaust:	10,724	11.82	69.8%
Evaporative:	1,875	2.07	12.2%
Refueling:	0	0.00	0.0%
Running Loss:	2,261	2.49	14.7%
Resting Loss:	496	0.55	3.2%
	15,357		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
All Areas	LDGV	44,051,643	62.8%		49,308	53.2%	419,012	53.6%	57,314	42.2%
	LDGT1	13,240,730	18.9%		19,508	21.1%	175,616	22.5%	22,400	16.5%
	LDGT2	6,090,491	8.7%		10,383	11.2%	94,023	12.0%	12,523	9.2%
	HDGV	1,949,975	2.8%		4,625	5.0%	46,167	5.9%	9,823	7.2%
	LDDV	139,156	0.2%		57	0.1%	170	0.0%	172	0.1%
	LDDT	69,910	0.1%		42	0.0%	98	0.0%	101	0.1%
	HDDV	4,089,357	5.8%		5,875	6.3%	33,582	4.3%	32,886	24.2%
	MC	487,282	0.7%		2,844	3.1%	13,433	1.7%	492	0.4%
	Total	70,118,544		23.5	92,640		782,101		135,711	
				Total Tons:	(102.12)		(862.12)		(149.60)	
				with Tier 2 Credits:	89,102				117,136	
					(98.22)				(129.12)	

VMT, VOC, CO, and NOX Inventory and Forecast By County By Vehicle Type
2007 with Control Strategy

County	VMT		Speed	VOC		CO		NOx	
	Miles	Pct.	(mph)	Kilograms	Pct.	Kilograms	Pct.	Kilograms	Pct.
	Kg	Ton	Pct.						
Exhaust:	64,823	71.45	70.0%						
Evaporative:	10,030	11.06	10.8%						
Refueling:	0	0.00	0.0%						
Running Loss:	15,130	16.68	16.3%						
Resting Loss:	2,658	2.93	2.9%						
	92,640								

VMT, VOC, CO, and NOX Inventory and Forecast By County By Vehicle Type
2011 with Control Strategy

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Allegheny	LDGV	22,278,753	64.1%		27,181	54.2%	239,556	56.0%	24,176	47.9%
	LDGT1	6,695,847	19.3%		10,539	21.0%	97,256	22.8%	9,269	18.4%
	LDGT2	3,080,608	8.9%		5,608	11.2%	49,042	11.5%	5,141	10.2%
	HDGV	750,935	2.2%		2,105	4.2%	15,796	3.7%	3,108	6.2%
	LDDV	69,128	0.2%		36	0.1%	110	0.0%	81	0.2%
	LDDT	34,726	0.1%		27	0.1%	63	0.0%	47	0.1%
	HDDV	1,575,608	4.5%		3,111	6.2%	17,299	4.0%	8,478	16.8%
	MC	246,370	0.7%		1,527	3.0%	8,320	1.9%	205	0.4%
	Total	34,731,975		16.5	50,134		427,440		50,504	
				Total Tons:	(55.26)		(471.17)		(55.67)	
				with Tier 2 Credits:	48,062				37,107	
					(52.98)				(40.90)	

	Kg	Ton	Pct.
Exhaust:	35,369	38.99	70.5%
Evaporative:	4,173	4.60	8.3%
Refueling:	0	0.00	0.0%
Running Loss:	9,621	10.61	19.2%
Resting Loss:	970	1.07	1.9%
	50,134		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Armstrong	LDGV	1,500,583	62.9%		1,591	52.8%	13,952	54.9%	2,307	47.9%
	LDGT1	451,060	18.9%		670	22.2%	6,106	24.0%	895	18.6%
	LDGT2	207,334	8.7%		379	12.6%	3,396	13.4%	519	10.8%
	HDGV	65,731	2.8%		120	4.0%	838	3.3%	332	6.9%
	LDDV	4,770	0.2%		1	0.0%	4	0.0%	6	0.1%
	LDDT	2,384	0.1%		1	0.0%	2	0.0%	3	0.1%
	HDDV	138,040	5.8%		161	5.3%	828	3.3%	737	15.3%
	MC	16,754	0.7%		93	3.1%	279	1.1%	19	0.4%
	Total	2,386,656		39.7	3,016		25,404		4,818	
				Total Tons.	(3.32)		(28.00)		(5.31)	
				with Tier 2 Credits:	2,877				3,800	
					(3.17)				(4.19)	

	Kg	Ton	Pct.
Exhaust:	2,254	2.48	74.7%
Evaporative:	384	0.42	12.7%
Refueling:	0	0.00	0.0%
Running Loss:	303	0.33	10.1%
Resting Loss:	75	0.08	2.5%
	3,016		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Beaver	LDGV	3,579,709	62.9%		3,629	52.6%	31,508	54.4%	4,738	44.8%
	LDGT1	1,075,810	18.9%		1,401	20.3%	12,836	22.1%	1,778	16.8%
	LDGT2	494,516	8.7%		829	12.0%	7,095	12.2%	1,075	10.2%
	HDGV	156,443	2.7%		336	4.9%	2,758	4.8%	784	7.4%
	LDDV	11,310	0.2%		5	0.1%	14	0.0%	15	0.1%
	LDDT	5,679	0.1%		3	0.0%	8	0.0%	9	0.1%
	HDDV	327,713	5.8%		454	6.6%	2,633	4.5%	2,147	20.3%
	MC	39,356	0.7%		238	3.5%	1,118	1.9%	41	0.4%
	Total	5,690,536		25.0	6,895		57,970		10,585	
				Total Tons:	(7.60)		(63.90)		(11.67)	
				with Tier 2 Credits:	6,561				8,419	

VMT, VOC, CO, and NOX Inventory and Forecast By County By Vehicle Type
2011 with Control Strategy

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
					(7.23)				(9.28)	

	Kg	Ton	Pct.
Exhaust:	4,907	5.41	71.2%
Evaporative:	779	0.86	11.3%
Refueling:	0	0.00	0.0%
Running Loss:	1,040	1.15	15.1%
Resting Loss:	170	0.19	2.5%
	6,895		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Butler	LDGV	3,979,752	61.5%		3,718	49.9%	34,504	51.7%	5,368	40.8%
	LDGT1	1,196,476	18.5%		1,657	22.3%	16,093	24.1%	2,256	17.2%
	LDGT2	550,432	8.5%		949	12.7%	8,976	13.4%	1,328	10.1%
	HDGV	218,817	3.4%		350	4.7%	3,168	4.7%	1,110	8.4%
	LDDV	12,843	0.2%		4	0.1%	11	0.0%	16	0.1%
	LDDT	6,452	0.1%		3	0.0%	6	0.0%	10	0.1%
	HDDV	458,703	7.1%		528	7.1%	3,058	4.6%	3,008	22.9%
	MC	44,322	0.7%		237	3.2%	941	1.4%	53	0.4%
	Total	6,467,797		37.5	7,447		66,758		13,150	
				Total Tons:	(8.21)		(73.59)		(14.50)	
				with Tier 2 Credits	7,074				10,435	
					(7.80)				(11.50)	

	Kg	Ton	Pct.
Exhaust:	5,591	6.16	75.1%
Evaporative:	902	0.99	12.1%
Refueling:	0	0.00	0.0%
Running Loss:	775	0.85	10.4%
Resting Loss:	178	0.20	2.4%
	7,447		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Fayette	LDGV	2,443,326	63.3%		2,720	53.5%	24,101	55.4%	4,095	49.4%
	LDGT1	734,402	19.0%		1,144	22.5%	10,459	24.0%	1,593	19.2%
	LDGT2	337,569	8.8%		648	12.8%	5,888	13.5%	928	11.2%
	HDGV	98,359	2.5%		180	3.5%	1,298	3.0%	500	6.0%
	LDDV	7,721	0.2%		2	0.0%	6	0.0%	10	0.1%
	LDDT	3,861	0.1%		2	0.0%	4	0.0%	5	0.1%
	HDDV	205,679	5.3%		240	4.7%	1,263	2.9%	1,134	13.7%
	MC	26,984	0.7%		147	2.9%	471	1.1%	31	0.4%
	Total	3,857,901		40.7	5,084		43,489		8,297	
				Total Tons:	(5.60)		(47.94)		(9.15)	
				with Tier 2 Credits:	4,858				6,644	
					(5.35)				(7.32)	

	Kg	Ton	Pct.
Exhaust:	3,823	4.21	75.2%
Evaporative:	646	0.71	12.7%
Refueling:	0	0.00	0.0%
Running Loss:	490	0.54	9.6%
Resting Loss:	125	0.14	2.5%
	5,084		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Washington	LDGV	5,222,930	60.7%		4,401	50.3%	38,105	51.3%	7,183	39.3%
	LDGT1	1,569,992	18.2%		1,721	19.7%	15,952	21.5%	2,719	14.9%

VMT, VOC, CO, and NOX Inventory and Forecast By County By Vehicle Type
2011 with Control Strategy

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
	LDGT2	722,255	8.4%		949	10.8%	8,438	11.4%	1,563	8.6%
	HDGV	326,586	3.8%		564	6.4%	5,357	7.2%	1,731	9.5%
	LDDV	16,995	0.2%		6	0.1%	17	0.0%	23	0.1%
	LDDT	8,555	0.1%		4	0.0%	10	0.0%	14	0.1%
	HDDV	684,364	7.9%		787	9.0%	4,837	6.5%	4,971	27.2%
	MC	57,913	0.7%		318	3.6%	1,500	2.0%	69	0.4%
	Total	8,609,590		33.2	8,750		74,217		18,273	
				Total Tons:	(9.65)		(81.81)		(20.14)	
				with Tier 2 Credits:	8,257				15,075	
					(9.10)				(16.62)	

	Kg	Ton	Pct.
Exhaust:	6,291	6.93	71.9%
Evaporative:	1,147	1.26	13.1%
Refueling:	0	0.00	0.0%
Running Loss:	1,077	1.19	12.3%
Resting Loss:	235	0.26	2.7%
	8,750		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
Westmoreland	LDGV	8,377,691	61.1%		7,961	50.9%	68,620	52.3%	11,203	40.0%
	LDGT1	2,518,397	18.4%		3,171	20.3%	28,790	21.9%	4,322	15.4%
	LDGT2	1,158,330	8.5%		1,783	11.4%	15,320	11.7%	2,503	8.9%
	HDGV	489,921	3.6%		880	5.6%	8,223	6.3%	2,505	9.0%
	LDDV	26,961	0.2%		10	0.1%	31	0.0%	36	0.1%
	LDDT	13,564	0.1%		8	0.0%	18	0.0%	21	0.1%
	HDDV	1,028,098	7.5%		1,278	8.2%	7,756	5.9%	7,288	26.0%
	MC	92,651	0.7%		544	3.5%	2,527	1.9%	102	0.4%
	Total	13,705,613		27.4	15,635		131,283		27,980	
				Total Tons:	(17.23)		(144.71)		(30.84)	
				with Tier 2 Credits:	14,845				22,863	
					(16.36)				(25.20)	

	Kg	Ton	Pct.
Exhaust:	11,199	12.34	71.6%
Evaporative:	1,811	2.00	11.6%
Refueling:	0	0.00	0.0%
Running Loss:	2,233	2.46	14.3%
Resting Loss:	392	0.43	2.5%
	15,635		

County		VMT Miles	VMT Pct.	Speed (mph)	VOC Kilograms	VOC Pct.	CO Kilograms	CO Pct.	NOx Kilograms	NOx Pct.
All Areas	LDGV	47,382,744	62.8%		51,202	52.8%	450,346	54.5%	59,069	44.2%
	LDGT1	14,241,984	18.9%		20,303	20.9%	187,491	22.7%	22,832	17.1%
	LDGT2	6,551,044	8.7%		11,145	11.5%	98,154	11.9%	13,056	9.8%
	HDGV	2,106,792	2.8%		4,535	4.7%	37,437	4.5%	10,071	7.5%
	LDDV	149,728	0.2%		65	0.1%	194	0.0%	186	0.1%
	LDDT	75,221	0.1%		47	0.0%	111	0.0%	109	0.1%
	HDDV	4,418,205	5.9%		6,559	6.8%	37,673	4.6%	27,763	20.8%
	MC	524,350	0.7%		3,105	3.2%	15,156	1.8%	519	0.4%
	Total	75,450,068		22.1	96,961		826,560		133,606	
				Total Tons:	(106.88)		(911.13)		(147.28)	
				with Tier 2 Credits:	92,533				104,343	
					(102.00)				(115.02)	

VMT, VOC, CO, and NOX Inventory and Forecast By County By Vehicle Type
2011 with Control Strategy

County	VMT		Speed	VOC		CO		NOx	
	Miles	Pct.	(mph)	Kilograms	Pct.	Kilograms	Pct.	Kilograms	Pct.
	Kg	Ton	Pct.						
Exhaust:	69,434	76.54	71.6%						
Evaporative:	9,842	10.85	10.2%						
Refueling:	0	0.00	0.0%						
Running Loss:	15,539	17.13	16.0%						
Resting Loss:	2,146	2.37	2.2%						
	96,961								

Pittsburgh 7-County Area MOBILE Input Files

1999 MOBILE INPUT FILE
Allegheny County

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5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, ALLE, 99
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
6            imflag
1        alhflg
5        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .062 .079 .080 .077 .084 .079 .073 .064 .063 .059
 .058 .050 .043 .036 .027 .020 .010 .006 .005 .004
 .005 .004 .003 .002 .008
 .042 .062 .059 .050 .062 .082 .070 .062 .065 .054
 .061 .061 .049 .048 .036 .027 .015 .014 .011 .008
 .017 .015 .010 .005 .014
 .093 .092 .100 .061 .085 .064 .046 .042 .036 .045
 .051 .041 .029 .036 .030 .021 .013 .012 .010 .008
 .022 .021 .013 .009 .023
 .053 .043 .066 .039 .070 .049 .042 .034 .039 .046
 .053 .052 .046 .051 .038 .031 .020 .023 .020 .023
 .032 .027 .022 .019 .063
 .062 .079 .080 .077 .084 .079 .073 .064 .063 .059
 .058 .050 .043 .036 .027 .020 .010 .006 .005 .004
 .005 .004 .003 .002 .008
 .042 .062 .059 .050 .062 .082 .070 .062 .065 .054
 .061 .061 .049 .048 .036 .027 .015 .014 .011 .008
 .017 .015 .010 .005 .014
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .064 .074 .063 .060 .051 .042 .038 .033 .024 .025
 .023 .503 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
2 1 2 1
97 20 75 80  3  3 096 221 2221 1211 220. 1.20 999.        Pre-81 Idle test
97 20 81 20  3  3 096 221 2221 2211 220. 1.20 999.        PA97 2-spd Idle
1.00 1.00 1.00 1.00 0.40
97 75 20 2221 21 096. 22212222                            ATP Program
97 75 20 2221 21 096.                                     EPA Pressure
4 99 58.2 80.6 20.6 27.3 20.6  7
99 1 1
[A  21F 2T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.617.185.085.033.002.001.070.007
4 99 57.1 88.3 20.6 27.3 20.6  7
99 1 1
[A  21F 2T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.642.193.089.021.002.001.045.007
4 99 57.8 92.7 20.6 27.3 20.6  7
99 1 1
[A  21F 2T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.612.185.085.035.002.001.073.007
4 99 59.5 74.5 20.6 27.3 20.6  7
99 1 1
[A  21F 2T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.619.186.086.032.002.001.067.007
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(Scenarios Repeated for Area, Facility, and Time Groupings)

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5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, ALLE, 07
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
6            imflag
1        alhflg
5        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .062 .079 .080 .077 .084 .079 .073 .064 .063 .059
 .058 .050 .043 .036 .027 .020 .010 .006 .005 .004
 .005 .004 .003 .002 .008
 .042 .062 .059 .050 .062 .082 .070 .062 .065 .054
 .061 .061 .049 .048 .036 .027 .015 .014 .011 .008
 .017 .015 .010 .005 .014
 .093 .092 .100 .061 .085 .064 .046 .042 .036 .045
 .051 .041 .029 .036 .030 .021 .013 .012 .010 .008
 .022 .021 .013 .009 .023
 .053 .043 .066 .039 .070 .049 .042 .034 .039 .046
 .053 .052 .046 .051 .038 .031 .020 .023 .020 .023
 .032 .027 .022 .019 .063
 .062 .079 .080 .077 .084 .079 .073 .064 .063 .059
 .058 .050 .043 .036 .027 .020 .010 .006 .005 .004
 .005 .004 .003 .002 .008
 .042 .062 .059 .050 .062 .082 .070 .062 .065 .054
 .061 .061 .049 .048 .036 .027 .015 .014 .011 .008
 .017 .015 .010 .005 .014
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .064 .074 .063 .060 .051 .042 .038 .033 .024 .025
 .023 .503 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
2 1 2 1
97 20 75 80  3  3 096 221 2221 1211 220. 1.20 999.        Pre-81 Idle test
97 20 81 20  3  3 096 221 2221 2211 220. 1.20 999.        PA97 2-spd Idle
1.00 1.00 1.00 1.00 0.40
97 75 20 2221 21 096. 22212222                            ATP Program
97 75 20 2221 21 096.                                     EPA Pressure
4  7 57.6 80.6 20.6 27.3 20.6  7
99 1 1
[A  21F 2T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.617.185.085.033.002.001.070.007
4  7 56.2 88.3 20.6 27.3 20.6  7
99 1 1
[A  21F 2T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.642.193.089.021.002.001.045.007
4  7 57.1 92.7 20.6 27.3 20.6  7
99 1 1
[A  21F 2T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.612.185.085.035.002.001.073.007
4  7 59.3 74.5 20.6 27.3 20.6  7
99 1 1
[A  21F 2T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.619.186.086.032.002.001.067.007
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(Scenarios Repeated for Area, Facility, and Time Groupings)

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5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, ALLE, 11
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
6            imflag
1        alhflg
5        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .062 .079 .080 .077 .084 .079 .073 .064 .063 .059
 .058 .050 .043 .036 .027 .020 .010 .006 .005 .004
 .005 .004 .003 .002 .008
 .042 .062 .059 .050 .062 .082 .070 .062 .065 .054
 .061 .061 .049 .048 .036 .027 .015 .014 .011 .008
 .017 .015 .010 .005 .014
 .093 .092 .100 .061 .085 .064 .046 .042 .036 .045
 .051 .041 .029 .036 .030 .021 .013 .012 .010 .008
 .022 .021 .013 .009 .023
 .053 .043 .066 .039 .070 .049 .042 .034 .039 .046
 .053 .052 .046 .051 .038 .031 .020 .023 .020 .023
 .032 .027 .022 .019 .063
 .062 .079 .080 .077 .084 .079 .073 .064 .063 .059
 .058 .050 .043 .036 .027 .020 .010 .006 .005 .004
 .005 .004 .003 .002 .008
 .042 .062 .059 .050 .062 .082 .070 .062 .065 .054
 .061 .061 .049 .048 .036 .027 .015 .014 .011 .008
 .017 .015 .010 .005 .014
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .064 .074 .063 .060 .051 .042 .038 .033 .024 .025
 .023 .503 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
2 1 2 1
97 20 75 80  3  3 096 221 2221 1211 220. 1.20 999.        Pre-81 Idle test
97 20 81 20  3  3 096 221 2221 2211 220. 1.20 999.        PA97 2-spd Idle
1.00 1.00 1.00 1.00 0.40
97 75 20 2221 21 096. 22212222                             ATP Program
97 75 20 2221 21 096.                                      EPA Pressure
4 11 57.2 80.6 20.6 27.3 20.6  7
99 1 1
[A  21F 2T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.617.185.085.033.002.001.070.007
4 11 55.6 88.3 20.6 27.3 20.6  7
99 1 1
[A  21F 2T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.642.193.089.021.002.001.045.007
4 11 56.6 92.7 20.6 27.3 20.6  7
99 1 1
[A  21F 2T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.612.185.085.035.002.001.073.007
4 11 59.2 74.5 20.6 27.3 20.6  7
99 1 1
[A  21F 2T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.619.186.086.032.002.001.067.007
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(Scenarios Repeated for Area, Facility, and Time Groupings)

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5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, ARMS, 99
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
1            imflag
1        alhflg
1        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .036 .055 .064 .068 .077 .068 .066 .063 .065 .064
 .069 .065 .056 .047 .037 .029 .014 .010 .008 .005
 .008 .007 .004 .003 .012
 .026 .040 .055 .043 .062 .067 .056 .053 .061 .054
 .066 .068 .057 .054 .046 .037 .024 .018 .014 .010
 .027 .024 .015 .006 .016
 .058 .064 .084 .052 .070 .056 .036 .035 .030 .044
 .050 .041 .034 .045 .046 .031 .025 .017 .011 .015
 .040 .037 .025 .014 .038
 .037 .032 .048 .033 .049 .034 .029 .025 .032 .034
 .046 .047 .037 .049 .051 .035 .027 .026 .026 .028
 .050 .043 .036 .025 .123
 .036 .055 .064 .068 .077 .068 .066 .063 .065 .064
 .069 .065 .056 .047 .037 .029 .014 .010 .008 .005
 .008 .007 .004 .003 .012
 .026 .040 .055 .043 .062 .067 .056 .053 .061 .054
 .066 .068 .057 .054 .046 .037 .024 .018 .014 .010
 .027 .024 .015 .006 .016
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .040 .051 .047 .041 .037 .030 .031 .036 .022 .023
 .024 .620 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
4 99 58.8 80.6 20.6 27.3 20.6  7
99 1 1
[A  31F 2T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.617.185.085.033.002.001.070.007
4 99 58.0 88.3 20.6 27.3 20.6  7
99 1 1
[A  31F 2T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.641.193.089.022.002.001.045.007
4 99 58.5 92.7 20.6 27.3 20.6  7
99 1 1
[A  31F 2T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.613.184.085.035.002.001.073.007
4 99 59.6 74.5 20.6 27.3 20.6  7
99 1 1
[A  31F 2T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.618.186.086.032.002.001.068.007
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

```
5       PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, ARMS, 07
1         tamflg
1         spdflg
2         vmtflg
3         mymrfg
2         newflg
1              imflag
1         alhflg
1         atpflg
5         rlflag
1         locflg
1         temflg
3         outfmt
4         prtflg
1         idlflg
3         nmhflg
3         hcflag
 .036 .055 .064 .068 .077 .068 .066 .063 .065 .064
 .069 .065 .056 .047 .037 .029 .014 .010 .008 .005
 .008 .007 .004 .003 .012
 .026 .040 .055 .043 .062 .067 .056 .053 .061 .054
 .066 .068 .057 .054 .046 .037 .024 .018 .014 .010
 .027 .024 .015 .006 .016
 .058 .064 .084 .052 .070 .056 .036 .035 .030 .044
 .050 .041 .034 .045 .046 .031 .025 .017 .011 .015
 .040 .037 .025 .014 .038
 .037 .032 .048 .033 .049 .034 .029 .025 .032 .034
 .046 .047 .037 .049 .051 .035 .027 .026 .026 .028
 .050 .043 .036 .025 .123
 .036 .055 .064 .068 .077 .068 .066 .063 .065 .064
 .069 .065 .056 .047 .037 .029 .014 .010 .008 .005
 .008 .007 .004 .003 .012
 .026 .040 .055 .043 .062 .067 .056 .053 .061 .054
 .066 .068 .057 .054 .046 .037 .024 .018 .014 .010
 .027 .024 .015 .006 .016
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .040 .051 .047 .041 .037 .030 .031 .036 .022 .023
 .024 .620 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
4  7 58.4 80.6 20.6 27.3 20.6  7
99 1 1
[A  31F 2T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.617.185.085.033.002.001.070.007
4  7 57.4 88.3 20.6 27.3 20.6  7
99 1 1
[A  31F 2T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.641.193.089.022.002.001.045.007
4  7 58.0 92.7 20.6 27.3 20.6  7
99 1 1
[A  31F 2T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.613.184.085.035.002.001.073.007
4  7 59.5 74.5 20.6 27.3 20.6  7
99 1 1
[A  31F 2T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.618.186.086.032.002.001.068.007
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, ARMS, 11
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
1            imflag
1        alhflg
1        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .036 .055 .064 .068 .077 .068 .066 .063 .065 .064
 .069 .065 .056 .047 .037 .029 .014 .010 .008 .005
 .008 .007 .004 .003 .012
 .026 .040 .055 .043 .062 .067 .056 .053 .061 .054
 .066 .068 .057 .054 .046 .037 .024 .018 .014 .010
 .027 .024 .015 .006 .016
 .058 .064 .084 .052 .070 .056 .036 .035 .030 .044
 .050 .041 .034 .045 .046 .031 .025 .017 .011 .015
 .040 .037 .025 .014 .038
 .037 .032 .048 .033 .049 .034 .029 .025 .032 .034
 .046 .047 .037 .049 .051 .035 .027 .026 .026 .028
 .050 .043 .036 .025 .123
 .036 .055 .064 .068 .077 .068 .066 .063 .065 .064
 .069 .065 .056 .047 .037 .029 .014 .010 .008 .005
 .008 .007 .004 .003 .012
 .026 .040 .055 .043 .062 .067 .056 .053 .061 .054
 .066 .068 .057 .054 .046 .037 .024 .018 .014 .010
 .027 .024 .015 .006 .016
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .040 .051 .047 .041 .037 .030 .031 .036 .022 .023
 .024 .620 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
4 11 58.1 80.6 20.6 27.3 20.6  7
99 1 1
[A  31F 2T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.617.185.085.033.002.001.070.007
4 11 57.0 88.3 20.6 27.3 20.6  7
99 1 1
[A  31F 2T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.641.193.089.022.002.001.045.007
4 11 57.7 92.7 20.6 27.3 20.6  7
99 1 1
[A  31F 2T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.613.184.085.035.002.001.073.007
4 11 59.4 74.5 20.6 27.3 20.6  7
99 1 1
[A  31F 2T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.618.186.086.032.002.001.068.007
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, BEAV, 99
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
6            imflag
1        alhflg
5        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .034 .061 .067 .073 .085 .078 .074 .065 .065 .064
 .068 .059 .048 .042 .031 .024 .012 .007 .007 .005
 .008 .006 .004 .002 .011
 .030 .046 .050 .050 .059 .079 .069 .062 .065 .054
 .065 .065 .050 .052 .039 .031 .017 .015 .013 .010
 .019 .020 .013 .007 .019
 .059 .063 .095 .058 .071 .055 .040 .040 .028 .046
 .050 .046 .032 .040 .042 .030 .018 .016 .012 .014
 .034 .035 .022 .014 .041
 .041 .031 .050 .031 .052 .040 .029 .025 .029 .041
 .043 .061 .045 .045 .035 .037 .028 .022 .022 .034
 .041 .042 .039 .023 .111
 .034 .061 .067 .073 .085 .078 .074 .065 .065 .064
 .068 .059 .048 .042 .031 .024 .012 .007 .007 .005
 .008 .006 .004 .002 .011
 .030 .046 .050 .050 .059 .079 .069 .062 .065 .054
 .065 .065 .050 .052 .039 .031 .017 .015 .013 .010
 .019 .020 .013 .007 .019
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .055 .059 .059 .044 .042 .038 .034 .025 .024 .023
 .028 .567 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
2 1 2 1
97 20 75 80  3  3 096 221 2221 1211 220. 1.20 999.        Pre-81 Idle test
97 20 81 20  3  3 096 221 2221 2211 220. 1.20 999.        PA97 2-spd Idle
1.00 1.00 1.00 1.00 0.40
97 75 20 2221 21 096. 22212222                             ATP Program
97 75 20 2221 21 096.                                      EPA Pressure
4 99 65.0 80.6 20.6 27.3 20.6  7
99 1 1
[A  41F 1T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.523.157.073.077.002.001.161.006
4 99 65.0 88.3 20.6 27.3 20.6  7
99 1 1
[A  41F 1T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.550.166.076.064.002.001.135.006
4 99 65.0 92.7 20.6 27.3 20.6  7
99 1 1
[A  41F 1T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.531.160.074.073.002.001.153.006
4 99 65.0 74.5 20.6 27.3 20.6  7
99 1 1
[A  41F 1T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.434.130.060.119.001.001.250.005
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, BEAV, 07
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
6            imflag
1        alhflg
5        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .034 .061 .067 .073 .085 .078 .074 .065 .065 .064
 .068 .059 .048 .042 .031 .024 .012 .007 .007 .005
 .008 .006 .004 .002 .011
 .030 .046 .050 .050 .059 .079 .069 .062 .065 .054
 .065 .065 .050 .052 .039 .031 .017 .015 .013 .010
 .019 .020 .013 .007 .019
 .059 .063 .095 .058 .071 .055 .040 .040 .028 .046
 .050 .046 .032 .040 .042 .030 .018 .016 .012 .014
 .034 .035 .022 .014 .041
 .041 .031 .050 .031 .052 .040 .029 .025 .029 .041
 .043 .061 .045 .045 .035 .037 .028 .022 .022 .034
 .041 .042 .039 .023 .111
 .034 .061 .067 .073 .085 .078 .074 .065 .065 .064
 .068 .059 .048 .042 .031 .024 .012 .007 .007 .005
 .008 .006 .004 .002 .011
 .030 .046 .050 .050 .059 .079 .069 .062 .065 .054
 .065 .065 .050 .052 .039 .031 .017 .015 .013 .010
 .019 .020 .013 .007 .019
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .055 .059 .059 .044 .042 .038 .034 .025 .024 .023
 .028 .567 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
2 1 2 1
97 20 75 80  3  3 096 221 2221 1211 220. 1.20 999.         Pre-81 Idle test
97 20 81 20  3  3 096 221 2221 2211 220. 1.20 999.         PA97 2-spd Idle
1.00 1.00 1.00 1.00 0.40
97 75 20 2221 21 096. 22212222                             ATP Program
97 75 20 2221 21 096.                                      EPA Pressure
4  7 65.0 80.6 20.6 27.3 20.6  7
99 1 1
[A  41F 1T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.523.157.073.077.002.001.161.006
4  7 65.0 88.3 20.6 27.3 20.6  7
99 1 1
[A  41F 1T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.550.166.076.064.002.001.135.006
4  7 65.0 92.7 20.6 27.3 20.6  7
99 1 1
[A  41F 1T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.531.160.074.073.002.001.153.006
4  7 65.0 74.5 20.6 27.3 20.6  7
99 1 1
[A  41F 1T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.434.130.060.119.001.001.250.005
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, BEAV, 11
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
6            imflag
1        alhflg
5        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .034 .061 .067 .073 .085 .078 .074 .065 .065 .064
 .068 .059 .048 .042 .031 .024 .012 .007 .007 .005
 .008 .006 .004 .002 .011
 .030 .046 .050 .050 .059 .079 .069 .062 .065 .054
 .065 .065 .050 .052 .039 .031 .017 .015 .013 .010
 .019 .020 .013 .007 .019
 .059 .063 .095 .058 .071 .055 .040 .040 .028 .046
 .050 .046 .032 .040 .042 .030 .018 .016 .012 .014
 .034 .035 .022 .014 .041
 .041 .031 .050 .031 .052 .040 .029 .025 .029 .041
 .043 .061 .045 .045 .035 .037 .028 .022 .022 .034
 .041 .042 .039 .023 .111
 .034 .061 .067 .073 .085 .078 .074 .065 .065 .064
 .068 .059 .048 .042 .031 .024 .012 .007 .007 .005
 .008 .006 .004 .002 .011
 .030 .046 .050 .050 .059 .079 .069 .062 .065 .054
 .065 .065 .050 .052 .039 .031 .017 .015 .013 .010
 .019 .020 .013 .007 .019
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .055 .059 .059 .044 .042 .038 .034 .025 .024 .023
 .028 .567 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
2 1 2 1
97 20 75 80  3  3 096 221 2221 1211 220. 1.20 999.          Pre-81 Idle test
97 20 81 20  3  3 096 221 2221 2211 220. 1.20 999.          PA97 2-spd Idle
1.00 1.00 1.00 1.00 0.40
97 75 20 2221 21 096. 22212222                               ATP Program
97 75 20 2221 21 096.                                        EPA Pressure
4 11 65.0 80.6 20.6 27.3 20.6  7
99 1 1
[A  41F 1T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.523.157.073.077.002.001.161.006
4 11 64.9 88.3 20.6 27.3 20.6  7
99 1 1
[A  41F 1T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.550.166.076.064.002.001.135.006
4 11 65.0 92.7 20.6 27.3 20.6  7
99 1 1
[A  41F 1T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.531.160.074.073.002.001.153.006
4 11 65.0 74.5 20.6 27.3 20.6  7
99 1 1
[A  41F 1T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.434.130.060.119.001.001.250.005
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, BUTL, 99
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
1            imflag
1        alhflg
1        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .102 .107 .083 .064 .073 .066 .060 .056 .055 .053
 .058 .050 .041 .034 .026 .021 .010 .006 .005 .004
 .006 .004 .003 .002 .011
 .066 .092 .050 .041 .057 .064 .056 .054 .061 .052
 .060 .062 .051 .045 .037 .030 .018 .014 .011 .008
 .020 .016 .012 .006 .017
 .067 .120 .086 .052 .065 .054 .041 .039 .030 .040
 .051 .043 .028 .040 .035 .031 .018 .015 .011 .013
 .031 .033 .020 .012 .026
 .047 .049 .064 .035 .061 .038 .036 .033 .032 .042
 .040 .040 .040 .048 .037 .038 .022 .021 .025 .025
 .039 .038 .030 .023 .094
 .102 .107 .083 .064 .073 .066 .060 .056 .055 .053
 .058 .050 .041 .034 .026 .021 .010 .006 .005 .004
 .006 .004 .003 .002 .011
 .066 .092 .050 .041 .057 .064 .056 .054 .061 .052
 .060 .062 .051 .045 .037 .030 .018 .014 .011 .008
 .020 .016 .012 .006 .017
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .052 .070 .062 .058 .044 .041 .039 .026 .023 .024
 .025 .534 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
4 99 65.0 80.6 20.6 27.3 20.6  7
99 1 1
[A 101F 1T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.574.172.079.054.002.001.112.006
4 99 65.0 88.3 20.6 27.3 20.6  7
99 1 1
[A 101F 1T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.591.178.082.045.002.001.094.007
4 99 65.0 92.7 20.6 27.3 20.6  7
99 1 1
[A 101F 1T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.581.174.080.050.002.001.106.006
4 99 65.0 74.5 20.6 27.3 20.6  7
99 1 1
[A 101F 1T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.510.153.071.083.002.001.174.006
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

```
5       PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, BUTL, 07
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
1            imflag
1        alhflg
1        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .102 .107 .083 .064 .073 .066 .060 .056 .055 .053
 .058 .050 .041 .034 .026 .021 .010 .006 .005 .004
 .006 .004 .003 .002 .011
 .066 .092 .050 .041 .057 .064 .056 .054 .061 .052
 .060 .062 .051 .045 .037 .030 .018 .014 .011 .008
 .020 .016 .012 .006 .017
 .067 .120 .086 .052 .065 .054 .041 .039 .030 .040
 .051 .043 .028 .040 .035 .031 .018 .015 .011 .013
 .031 .033 .020 .012 .026
 .047 .049 .064 .035 .061 .038 .036 .033 .032 .042
 .040 .040 .040 .048 .037 .038 .022 .021 .025 .025
 .039 .038 .030 .023 .094
 .102 .107 .083 .064 .073 .066 .060 .056 .055 .053
 .058 .050 .041 .034 .026 .021 .010 .006 .005 .004
 .006 .004 .003 .002 .011
 .066 .092 .050 .041 .057 .064 .056 .054 .061 .052
 .060 .062 .051 .045 .037 .030 .018 .014 .011 .008
 .020 .016 .012 .006 .017
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .052 .070 .062 .058 .044 .041 .039 .026 .023 .024
 .025 .534 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
4  7 65.0 80.6 20.6 27.3 20.6  7
99 1 1
[A 101F 1T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.574.172.079.054.002.001.112.006
4  7 64.8 88.3 20.6 27.3 20.6  7
99 1 1
[A 101F 1T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.591.178.082.045.002.001.094.007
4  7 64.9 92.7 20.6 27.3 20.6  7
99 1 1
[A 101F 1T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.581.174.080.050.002.001.106.006
4  7 65.0 74.5 20.6 27.3 20.6  7
99 1 1
[A 101F 1T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.510.153.071.083.002.001.174.006
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, BUTL, 11
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
1            imflag
1        alhflg
1        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .102 .107 .083 .064 .073 .066 .060 .056 .055 .053
 .058 .050 .041 .034 .026 .021 .010 .006 .005 .004
 .006 .004 .003 .002 .011
 .066 .092 .050 .041 .057 .064 .056 .054 .061 .052
 .060 .062 .051 .045 .037 .030 .018 .014 .011 .008
 .020 .016 .012 .006 .017
 .067 .120 .086 .052 .065 .054 .041 .039 .030 .040
 .051 .043 .028 .040 .035 .031 .018 .015 .011 .013
 .031 .033 .020 .012 .026
 .047 .049 .064 .035 .061 .038 .036 .033 .032 .042
 .040 .040 .040 .048 .037 .038 .022 .021 .025 .025
 .039 .038 .030 .023 .094
 .102 .107 .083 .064 .073 .066 .060 .056 .055 .053
 .058 .050 .041 .034 .026 .021 .010 .006 .005 .004
 .006 .004 .003 .002 .011
 .066 .092 .050 .041 .057 .064 .056 .054 .061 .052
 .060 .062 .051 .045 .037 .030 .018 .014 .011 .008
 .020 .016 .012 .006 .017
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .052 .070 .062 .058 .044 .041 .039 .026 .023 .024
 .025 .534 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
4 11 65.0 80.6 20.6 27.3 20.6  7
99 1 1
[A 101F 1T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.574.172.079.054.002.001.112.006
4 11 64.7 88.3 20.6 27.3 20.6  7
99 1 1
[A 101F 1T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.591.178.082.045.002.001.094.007
4 11 64.8 92.7 20.6 27.3 20.6  7
99 1 1
[A 101F 1T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.581.174.080.050.002.001.106.006
4 11 65.0 74.5 20.6 27.3 20.6  7
99 1 1
[A 101F 1T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.510.153.071.083.002.001.174.006
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

1999 MOBILE INPUT FILE
Fayette County

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, FAYE, 99
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
1            imflag
1        alhflg
1        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .029 .051 .057 .063 .073 .067 .065 .061 .064 .065
 .071 .068 .058 .054 .041 .032 .017 .011 .008 .007
 .010 .007 .005 .003 .012
 .026 .042 .046 .040 .056 .067 .054 .053 .056 .047
 .057 .069 .055 .058 .046 .038 .024 .020 .017 .013
 .032 .029 .019 .011 .024
 .054 .064 .081 .046 .061 .050 .038 .040 .031 .037
 .044 .043 .038 .050 .041 .033 .023 .018 .016 .014
 .042 .042 .025 .019 .050
 .032 .024 .046 .036 .058 .035 .032 .033 .028 .037
 .048 .039 .043 .037 .043 .038 .025 .024 .028 .035
 .055 .049 .035 .025 .116
 .029 .051 .057 .063 .073 .067 .065 .061 .064 .065
 .071 .068 .058 .054 .041 .032 .017 .011 .008 .007
 .010 .007 .005 .003 .012
 .026 .042 .046 .040 .056 .067 .054 .053 .056 .047
 .057 .069 .055 .058 .046 .038 .024 .020 .017 .013
 .032 .029 .019 .011 .024
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .061 .056 .059 .039 .041 .037 .033 .024 .021 .023
 .023 .584 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
4 99 58.4 80.6 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 1    ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.622.187.086.031.002.001.064.007
4 99 57.5 88.3 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 2    ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.646.194.089.020.002.001.041.007
4 99 58.1 92.7 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 3    ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.620.186.085.032.002.001.067.007
4 99 59.5 74.5 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 4    ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.624.188.086.030.002.001.062.007
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, FAYE, 07
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
1            imflag
1        alhflg
1        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .029 .051 .057 .063 .073 .067 .065 .061 .064 .065
 .071 .068 .058 .054 .041 .032 .017 .011 .008 .007
 .010 .007 .005 .003 .012
 .026 .042 .046 .040 .056 .067 .054 .053 .056 .047
 .057 .069 .055 .058 .046 .038 .024 .020 .017 .013
 .032 .029 .019 .011 .024
 .054 .064 .081 .046 .061 .050 .038 .040 .031 .037
 .044 .043 .038 .050 .041 .033 .023 .018 .016 .014
 .042 .042 .025 .019 .050
 .032 .024 .046 .036 .058 .035 .032 .033 .028 .037
 .048 .039 .043 .037 .043 .038 .025 .024 .028 .035
 .055 .049 .035 .025 .116
 .029 .051 .057 .063 .073 .067 .065 .061 .064 .065
 .071 .068 .058 .054 .041 .032 .017 .011 .008 .007
 .010 .007 .005 .003 .012
 .026 .042 .046 .040 .056 .067 .054 .053 .056 .047
 .057 .069 .055 .058 .046 .038 .024 .020 .017 .013
 .032 .029 .019 .011 .024
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .061 .056 .059 .039 .041 .037 .033 .024 .021 .023
 .023 .584 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
4  7 57.8 84.3 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 24HR] C 63.0 95.0  7.8  7.8 20 1 1 1 1
.626.188.087.029.002.001.060.007
4  7 57.9 80.6 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.622.187.086.031.002.001.064.007
4  7 56.7 88.3 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.646.194.089.020.002.001.041.007
4  7 57.5 92.7 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.620.186.085.032.002.001.067.007
4  7 59.4 74.5 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.624.188.086.030.002.001.062.007
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, FAYE, 11
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
1            imflag
1        alhflg
1        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .029 .051 .057 .063 .073 .067 .065 .061 .064 .065
 .071 .068 .058 .054 .041 .032 .017 .011 .008 .007
 .010 .007 .005 .003 .012
 .026 .042 .046 .040 .056 .067 .054 .053 .056 .047
 .057 .069 .055 .058 .046 .038 .024 .020 .017 .013
 .032 .029 .019 .011 .024
 .054 .064 .081 .046 .061 .050 .038 .040 .031 .037
 .044 .043 .038 .050 .041 .033 .023 .018 .016 .014
 .042 .042 .025 .019 .050
 .032 .024 .046 .036 .058 .035 .032 .033 .028 .037
 .048 .039 .043 .037 .043 .038 .025 .024 .028 .035
 .055 .049 .035 .025 .116
 .029 .051 .057 .063 .073 .067 .065 .061 .064 .065
 .071 .068 .058 .054 .041 .032 .017 .011 .008 .007
 .010 .007 .005 .003 .012
 .026 .042 .046 .040 .056 .067 .054 .053 .056 .047
 .057 .069 .055 .058 .046 .038 .024 .020 .017 .013
 .032 .029 .019 .011 .024
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .061 .056 .059 .039 .041 .037 .033 .024 .021 .023
 .023 .584 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
4 11 57.6 80.6 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.622.187.086.031.002.001.064.007
4 11 56.2 88.3 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.646.194.089.020.002.001.041.007
4 11 57.1 92.7 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.620.186.085.032.002.001.067.007
4 11 59.3 74.5 20.6 27.3 20.6  7
99 1 1
[A 261F 2T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.624.188.086.030.002.001.062.007
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

1999 MOBILE INPUT FILE
Washington County

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, WASH, 99
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
6            imflag
1        alhflg
5        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .037 .066 .072 .076 .085 .079 .072 .064 .065 .064
 .063 .058 .046 .041 .029 .023 .012 .007 .006 .005
 .007 .005 .004 .002 .011
 .031 .049 .056 .052 .069 .076 .064 .058 .065 .054
 .063 .062 .052 .050 .040 .029 .018 .014 .013 .009
 .022 .018 .012 .007 .018
 .070 .061 .092 .065 .091 .062 .051 .041 .034 .046
 .051 .046 .031 .041 .030 .024 .013 .015 .011 .011
 .029 .025 .020 .010 .030
 .040 .031 .052 .034 .052 .038 .035 .028 .030 .040
 .045 .050 .041 .052 .045 .039 .023 .028 .030 .030
 .050 .040 .029 .021 .099
 .037 .066 .072 .076 .085 .079 .072 .064 .065 .064
 .063 .058 .046 .041 .029 .023 .012 .007 .006 .005
 .007 .005 .004 .002 .011
 .031 .049 .056 .052 .069 .076 .064 .058 .065 .054
 .063 .062 .052 .050 .040 .029 .018 .014 .013 .009
 .022 .018 .012 .007 .018
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .063 .067 .070 .065 .051 .041 .032 .027 .024 .022
 .020 .519 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
2 1 2 1
97 20 75 80  3  3 096 221 2221 1211 220. 1.20 999.        Pre-81 Idle test
97 20 81 20  3  3 096 221 2221 2211 220. 1.20 999.        PA97 2-spd Idle
1.00 1.00 1.00 1.00 0.40
97 75 20 2221 21 096. 22212222                             ATP Program
97 75 20 2221 21 096.                                      EPA Pressure
4 99 65.0 80.6 20.6 27.3 20.6  7
99 1 1
[A 621F 1T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.558.168.077.061.002.001.127.006
4 99 65.0 88.3 20.6 27.3 20.6  7
99 1 1
[A 621F 1T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.579.174.080.051.002.001.106.007
4 99 65.0 92.7 20.6 27.3 20.6  7
99 1 1
[A 621F 1T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.566.170.078.057.002.001.120.006
4 99 65.0 74.5 20.6 27.3 20.6  7
99 1 1
[A 621F 1T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.488.146.067.094.002.001.197.005
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, WASH, 07
1         tamflg
1         spdflg
2         vmtflg
3         mymrfg
2         newflg
6             imflag
1         alhflg
5         atpflg
5         rlflag
1         locflg
1         temflg
3         outfmt
4         prtflg
1         idlflg
3         nmhflg
3         hcflag
 .037 .066 .072 .076 .085 .079 .072 .064 .065 .064
 .063 .058 .046 .041 .029 .023 .012 .007 .006 .005
 .007 .005 .004 .002 .011
 .031 .049 .056 .052 .069 .076 .064 .058 .065 .054
 .063 .062 .052 .050 .040 .029 .018 .014 .013 .009
 .022 .018 .012 .007 .018
 .070 .061 .092 .065 .091 .062 .051 .041 .034 .046
 .051 .046 .031 .041 .030 .024 .013 .015 .011 .011
 .029 .025 .020 .010 .030
 .040 .031 .052 .034 .052 .038 .035 .028 .030 .040
 .045 .050 .041 .052 .045 .039 .023 .028 .030 .030
 .050 .040 .029 .021 .099
 .037 .066 .072 .076 .085 .079 .072 .064 .065 .064
 .063 .058 .046 .041 .029 .023 .012 .007 .006 .005
 .007 .005 .004 .002 .011
 .031 .049 .056 .052 .069 .076 .064 .058 .065 .054
 .063 .062 .052 .050 .040 .029 .018 .014 .013 .009
 .022 .018 .012 .007 .018
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .063 .067 .070 .065 .051 .041 .032 .027 .024 .022
 .020 .519 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
2 1 2 1
97 20 75 80  3  3 096 221 2221 1211 220. 1.20 999.         Pre-81 Idle test
97 20 81 20  3  3 096 221 2221 2211 220. 1.20 999.         PA97 2-spd Idle
1.00 1.00 1.00 1.00 0.40
97 75 20 2221 21 096. 22212222                             ATP Program
97 75 20 2221 21 096.                                      EPA Pressure
4  7 65.0 80.6 20.6 27.3 20.6  7
99 1 1
[A 621F 1T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.558.168.077.061.002.001.127.006
4  7 64.9 88.3 20.6 27.3 20.6  7
99 1 1
[A 621F 1T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.579.174.080.051.002.001.106.007
4  7 64.9 92.7 20.6 27.3 20.6  7
99 1 1
[A 621F 1T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.566.170.078.057.002.001.120.006
4  7 65.0 74.5 20.6 27.3 20.6  7
99 1 1
[A 621F 1T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.488.146.067.094.002.001.197.005
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

2011 MOBILE INPUT FILE
Washington County

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, WASH, 11
1         tamflg
1         spdflg
2         vmtflg
3         mymrfg
2         newflg
6             imflag
1         alhflg
5         atpflg
5         rlflag
1         locflg
1         temflg
3         outfmt
4         prtflg
1         idlflg
3         nmhflg
3         hcflag
 .037 .066 .072 .076 .085 .079 .072 .064 .065 .064
 .063 .058 .046 .041 .029 .023 .012 .007 .006 .005
 .007 .005 .004 .002 .011
 .031 .049 .056 .052 .069 .076 .064 .058 .065 .054
 .063 .062 .052 .050 .040 .029 .018 .014 .013 .009
 .022 .018 .012 .007 .018
 .070 .061 .092 .065 .091 .062 .051 .041 .034 .046
 .051 .046 .031 .041 .030 .024 .013 .015 .011 .011
 .029 .025 .020 .010 .030
 .040 .031 .052 .034 .052 .038 .035 .028 .030 .040
 .045 .050 .041 .052 .045 .039 .023 .028 .030 .030
 .050 .040 .029 .021 .099
 .037 .066 .072 .076 .085 .079 .072 .064 .065 .064
 .063 .058 .046 .041 .029 .023 .012 .007 .006 .005
 .007 .005 .004 .002 .011
 .031 .049 .056 .052 .069 .076 .064 .058 .065 .054
 .063 .062 .052 .050 .040 .029 .018 .014 .013 .009
 .022 .018 .012 .007 .018
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .063 .067 .070 .065 .051 .041 .032 .027 .024 .022
 .020 .519 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
2 1 2 1
97 20 75 80  3  3 096 221 2221 1211 220. 1.20 999.        Pre-81 Idle test
97 20 81 20  3  3 096 221 2221 2211 220. 1.20 999.        PA97 2-spd Idle
1.00 1.00 1.00 1.00 0.40
97 75 20 2221 21 096. 22212222                             ATP Program
97 75 20 2221 21 096.                                      EPA Pressure
4 11 65.0 80.6 20.6 27.3 20.6  7
99 1 1
[A 621F 1T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.558.168.077.061.002.001.127.006
4 11 64.7 88.3 20.6 27.3 20.6  7
99 1 1
[A 621F 1T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.579.174.080.051.002.001.106.007
4 11 64.8 92.7 20.6 27.3 20.6  7
99 1 1
[A 621F 1T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.566.170.078.057.002.001.120.006
4 11 65.0 74.5 20.6 27.3 20.6  7
99 1 1
[A 621F 1T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.488.146.067.094.002.001.197.005
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

```
5      PROMPT [PPAQ1 VERSION 4.01 ] [M5INPUT ]
RMS with PennDOT Growth Rates, WEST, 99
1        tamflg
1        spdflg
2        vmtflg
3        mymrfg
2        newflg
6            imflag
1        alhflg
5        atpflg
5        rlflag
1        locflg
1        temflg
3        outfmt
4        prtflg
1        idlflg
3        nmhflg
3        hcflag
 .038 .063 .069 .072 .085 .077 .075 .067 .068 .062
 .063 .058 .049 .042 .030 .024 .012 .008 .006 .005
 .006 .005 .003 .002 .010
 .030 .044 .051 .046 .060 .080 .067 .059 .065 .055
 .061 .066 .054 .050 .041 .029 .018 .015 .012 .010
 .022 .021 .016 .008 .022
 .066 .065 .088 .057 .082 .061 .044 .040 .029 .044
 .050 .044 .034 .044 .034 .029 .015 .013 .012 .012
 .032 .032 .022 .014 .033
 .045 .037 .052 .039 .063 .044 .035 .033 .032 .043
 .048 .048 .042 .053 .035 .034 .021 .025 .023 .025
 .045 .036 .030 .022 .091
 .038 .063 .069 .072 .085 .077 .075 .067 .068 .062
 .063 .058 .049 .042 .030 .024 .012 .008 .006 .005
 .006 .005 .003 .002 .010
 .030 .044 .051 .046 .060 .080 .067 .059 .065 .055
 .061 .066 .054 .050 .041 .029 .018 .015 .012 .010
 .022 .021 .016 .008 .022
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
 .054 .053 .046 .026 .024 .020 .015 .018 .014 .010
 .005 .006 .004 .003 .008
 .066 .064 .055 .057 .042 .038 .034 .028 .025 .022
 .023 .546 .000 .000 .000 .000 .000 .000 .000 .000
 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
2 1 2 1
97 20 75 80  3  3 096 221 2221 1211 220. 1.20 999.          Pre-81 Idle test
97 20 81 20  3  3 096 221 2221 2211 220. 1.20 999.          PA97 2-spd Idle
1.00 1.00 1.00 1.00 0.40
97 75 20 2221 21 096. 22212222                              ATP Program
97 75 20 2221 21 096.                                       EPA Pressure
4 99 65.0 80.6 20.6 27.3 20.6  7
99 1 1
[A 641F 1T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.495.149.068.090.002.001.189.006
4 99 64.9 88.3 20.6 27.3 20.6  7
99 1 1
[A 641F 1T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.526.158.073.076.002.001.158.006
4 99 65.0 92.7 20.6 27.3 20.6  7
99 1 1
[A 641F 1T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.505.152.070.085.002.001.179.006
4 99 65.0 74.5 20.6 27.3 20.6  7
99 1 1
[A 641F 1T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
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(Scenarios Repeated for Area, Facility, and Time Groupings)

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5        atpflg
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1        temflg
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4        prtflg
1        idlflg
3        nmhflg
3        hcflag
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 .045 .037 .052 .039 .063 .044 .035 .033 .032 .043
 .048 .048 .042 .053 .035 .034 .021 .025 .023 .025
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 .063 .058 .049 .042 .030 .024 .012 .008 .006 .005
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 .030 .044 .051 .046 .060 .080 .067 .059 .065 .055
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 .000 .000 .000 .000 .000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
2 1 2 1
97 20 75 80  3  3 096 221 2221 1211 220. 1.20 999.         Pre-81 Idle test
97 20 81 20  3  3 096 221 2221 2211 220. 1.20 999.         PA97 2-spd Idle
1.00 1.00 1.00 1.00 0.40
97 75 20 2221 21 096. 22212222                              ATP Program
97 75 20 2221 21 096.                                       EPA Pressure
4  7 65.0 80.6 20.6 27.3 20.6  7
99 1 1
[A 641F 1T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.495.149.068.090.002.001.189.006
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99 1 1
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99 1 1
[A 641F 1T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
.505.152.070.085.002.001.179.006
4  7 65.0 74.5 20.6 27.3 20.6  7
99 1 1
[A 641F 1T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.390.117.054.140.001.001.293.004
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(Scenarios Repeated for Area, Facility, and Time Groupings)

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1         spdflg
2         vmtflg
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2         newflg
6             imflag
1         alhflg
5         atpflg
5         rlflag
1         locflg
1         temflg
3         outfmt
4         prtflg
1         idlflg
3         nmhflg
3         hcflag
 .038 .063 .069 .072 .085 .077 .075 .067 .068 .062
 .063 .058 .049 .042 .030 .024 .012 .008 .006 .005
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 .030 .044 .051 .046 .060 .080 .067 .059 .065 .055
 .061 .066 .054 .050 .041 .029 .018 .015 .012 .010
 .022 .021 .016 .008 .022
 .049 .120 .090 .082 .061 .058 .067 .064 .056 .050
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 .023 .546 .000 .000 .000 .000 .000 .000 .000 .000
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004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
2 1 2 1
97 20 75 80  3  3 096 221 2221 1211 220. 1.20 999.        Pre-81 Idle test
97 20 81 20  3  3 096 221 2221 2211 220. 1.20 999.        PA97 2-spd Idle
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97 75 20 2221 21 096. 22212222                             ATP Program
97 75 20 2221 21 096.                                      EPA Pressure
4 11 64.9 80.6 20.6 27.3 20.6  7
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[A 641F 1T 1   ] C 74.2 83.8  7.8  7.8 20 1 1 1 1
.495.149.068.090.002.001.189.006
4 11 64.6 88.3 20.6 27.3 20.6  7
99 1 1
[A 641F 1T 2   ] C 83.8 90.5  7.8  7.8 20 1 1 1 1
.526.158.073.076.002.001.158.006
4 11 64.8 92.7 20.6 27.3 20.6  7
99 1 1
[A 641F 1T 3   ] C 88.0 95.0  7.8  7.8 20 1 1 1 1
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4 11 65.0 74.5 20.6 27.3 20.6  7
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[A 641F 1T 4   ] C 63.0 80.3  7.8  7.8 20 1 1 1 1
.390.117.054.140.001.001.293.004
```

(Scenarios Repeated for Area, Facility, and Time Groupings)

Pennsylvania Department of Environmental Protection

Rachel Carson State Office Building
P.O. Box 8468
Harrisburg, PA 17105-8468

April 17, 2001

Bureau of Air Quality 717-787-9495

Dear Stakeholder or Interested Party:

Please find enclosed page 23 of the Proposed Pittsburgh-Beaver Valley Area Ozone Maintenance Plan and Request for Redesignation as Attainment for Ozone. Due to a problem with the copier, page 23 was inadvertently left out of the packet.

Sincerely,

J. Wick Havens
Division Chief
Air Resource Management

Enclosure

RECEIVED

APR 20 2001

Programs Associate Dir. (3AP00)

C. PERMANENT AND ENFORCEABLE CONTROL MEASURES

This section summarizes the permanent and enforceable control measures that contributed to the reductions in ozone precursor emissions from 1990 to 1999 in the Pittsburgh-Beaver Valley Area. Table II-5 presents a summary of the emissions data in Tables II-1 and II-2 for point sources, stationary area sources, highway vehicles, and nonroad engines/vehicles.

Table II-5
VOC and NO_x Emissions Summary: 1990 and 1999
Pittsburgh-Beaver Valley Area

	VOC Emissions (tons per day)	
Major Source Category	**1990**	**1999**
Point Sources	96	34
Stationary Area Sources	128	130
Highway Vehicles	150* (176)	110
Nonroad Engines/Vehicles	28# (82)	64
Total	**402**	**338**

		NO_x Emissions (tons per day)
Major Source Category	**1990**	**1999**
Point Sources	555	282
Stationary Area Sources	18	10
Highway Vehicles	144* (223)	171
Nonroad Engines/Vehicles	54# (83)	75
Total	**771**	**538**

* Highway vehicle emissions estimates for 1999 and beyond use newer techniques including an updated mobile model, more recent planning data and improved handling of truck VMT estimates. A revised estimate of the 1990 highway emissions using these improvements would result in emissions of 176 TPD for VOC and 223 TPD for NO_x.

Nonroad Engines/Vehicles emission estimates for 1999 and beyond use newer techniques including the EPA Nonroad Model. A revised estimate of the 1990 emissions using the Nonroad Model improvement would result in emissions of 82 TPD for VOC and 83 TPD for NO_x.

1. Point Sources

J11

Pennsylvania Department of Environmental Protection

Rachel Carson State Office Building
P.O. Box 2063
Harrisburg, PA 17105-2063

April 9, 2001

Office of the Secretary

E-mail: DavidHess@state.pa.us
Phone: 717-787-2814

Mr. Thomas Voltaggio
Acting Regional Administrator
U.S. Environmental Protection Agency
Region III (3RA00)
1650 Arch Street
Philadelphia, PA 19103-2029

Dear Mr. Voltaggio:

I am pleased to enclose a copy of the proposed Pittsburgh-Beaver Valley Ozone Maintenance Plan and Request for Redesignation as Attainment for Ozone. Attaining the ozone standard for Southwest Pennsylvania is an important milestone for Pennsylvania and the stakeholders who worked with us to make this possible.

This proposed state implementation plan is being submitted for parallel processing by EPA. Also enclosed is a copy of the notice advertising the public hearing and public comment period as required by the Clean Air Act (CAA).

If you have any questions please contact Wick Havens, Bureau of Air Quality at 717-787-9495.

Sincerely,

David E. Hess
Acting Secretary

Enclosure

cc: Marcia Spink
David Arnold

PROPOSED REVISION TO THE STATE IMPLEMENTATION PLAN FOR OZONE FOR THE PITTSBURGH-BEAVER VALLEY OZONE NONATTAINMENT AREA

PROPOSED MAINTENANCE PLAN

Public Hearing

Ground-level ozone concentrations above the federal health-based standard are a serious human health threat and can also cause damage to crops, forests and wildlife. The Pittsburgh-Beaver Valley ozone nonattainment area (Allegheny, Armstrong, Beaver, Butler, Fayette, Washington and Westmoreland counties) has not experienced a violation of the one-hour ozone standard for the past three years (1998-2000). Therefore, the Pennsylvania Department of Environmental Protection (DEP) plans to submit a request to redesignate this area to attainment. DEP is seeking public comment on this request and on a state implementation plan (SIP) revision setting forth a maintenance plan for the next 10 years. The maintenance plan, once found adequate by the federal Environmental Protection Agency, will establish new motor vehicle emission budgets for purposes of transportation conformity.

This proposal is available on the DEP Website at http://www.dep.state.pa.us (choose Information by Subject/Air Quality/State Implementation Plans), or through the contact person(s) listed below.

The Department will hold a public hearing to receive comments on the SIP revision on Tuesday May 1, 2001 at 1 p.m. at the offices of the DEP Southwest Regional Office, Waterfront Room A, 500 Building, 500 Waterfront Drive, Pittsburgh, PA 15222-4745. The Department's Southwest Regional Office is located at Washington's Landing beneath the 31st Bridge along Pa. Route 28.

Persons wishing to present testimony at the hearing should contact Connie Cross, 717-787-9495 (P.O. Box 8468, Harrisburg, PA 17105) to reserve a time. If you do not reserve a time, you will be able to testify as time allows. Witnesses should keep testimony to 10 minutes and should provide two written copies at the hearing. Persons with a disability who wish to attend the hearing and require an auxiliary aid, service or other accommodation to participate in the proceeding should contact Wick Havens at the telephone above. TDD users may contact the AT&T Relay Service at 800-654-5984 to discuss how the Department can best accommodate their needs.

Written comments should be sent to Wick Havens, Chief Division of Air Resource Management, Bureau of Air Quality, PO Box 8468, Harrisburg, PA 17105-8468 no later than noon on May 2, 2001.

PROPOSED PITTSBURGH-BEAVER VALLEY AREA OZONE MAINTENANCE PLAN AND REQUEST FOR REDESIGNATION AS ATTAINMENT FOR OZONE

APRIL 2001

Pennsylvania Department of
Environmental Protection
Bureau of Air Quality
P.O. Box 2357
Harrisburg, PA 17105-2357

www.dep.state.pa.us

Prepared with support by:

E.H. Pechan & Associates, Inc.
5528-B Hempstead Way
Springfield, VA 22151

CONTENTS

TABLES AND FIGURES

ACRONYMS AND ABBREVIATIONS

AEO	Annual Energy Outlook
AIM	architectural and industrial maintenance
CAA	Clean Air Act
CMSA	consolidated metropolitan statistical area
CO	carbon monoxide
CTG	Control Techniques Guideline
DEP	Department of Environmental Protection
DOT	Department of Transportation
EGAS	Economic Growth Analysis System
EPA	U.S. Environmental Protection Agency
FMVCP	Federal Motor Vehicle Control Program
FTP	Federal Test Procedure
GVWR	gross vehicle weight rating
HAP	hazardous air pollutant
HDDV	heavy-duty diesel vehicle
I/M	inspection and maintenance
LDGTs	light-duty gasoline trucks
LDGT1s	light-duty gasoline trucks 1 (< 6,000 pounds GVWR)
LDGT2s	light-duty gasoline trucks 2 (< 6,000 - 8,500 pounds GVWR)
LDGVs	light-duty gasoline vehicles
LRP	long range plans
MACT	maximum achievable control technology
MSA	metropolitan statistical area
MVMA	Motor Vehicle Manufacturers Association
NAAQS	National Ambient Air Quality Standard
NESHAP	National Emission Standard for Hazardous Air Pollutants
NO_x	oxides of nitrogen
OMS	Office of Mobile Sources
PennDOT	Pennsylvania Department of Transportation
PM_{10}	particulate matter under 10 microns
POTW	publicly-owned treatment works
ppb	parts per billion
ppm	parts per million
PSD	prevention of significant deterioration
psi	pounds per square inch
RACT	reasonably available control technology
REMI	Regional Economic Models, Inc.
RVP	Reid vapor pressure
SIC	Standard Industrial Classification
SIP	State Implementation Plan
TIPs	Transportation Improvement Programs
TSDF	treatment, storage, and disposal facility
VMT	vehicle miles traveled
VOC	volatile organic compound
VRS	vapor recovery systems

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EXECUTIVE SUMMARY

This report is a formal request to the U.S. Environmental Protection Agency (EPA) to redesignate the Pittsburgh-Beaver Valley Ozone Nonattainment Area to attainment of the health-based one-hour ozone National Ambient Air Quality Standard (NAAQS). It summarizes the progress of the area in attaining the ozone standard, demonstrates that all Clean Air Act (CAA) requirements for attainment have been adopted and presents a maintenance plan to assure continued attainment over the next ten years.

Analyses included in this document show that measured ambient air quality has attained the NAAQS for ozone and that the emission reductions responsible for the air quality improvement are both permanent and enforceable. This report also includes a maintenance plan that provides for maintenance of the ozone NAAQS for 10 years after redesignation.

The Pittsburgh-Beaver Valley Area was classified by the U.S. Environmental Protection Agency (EPA) as a moderate ozone nonattainment area on November 6, 1991. The primary years used by EPA for the purposes of establishing ozone designations and classifications were 1987 to 1989. For this base year period, the Pittsburgh-Beaver Valley Area ozone design value was 0.149 parts per million (ppm). The comparable design value for the 1998-2000 period is 0.123 ppm. The number of expected exceedances declined from 7.0 days per year during 1987-1989 to 1.0 days per year during 1998-2000.

Figures 1 and 2 show the estimated volatile organic compound (VOC) and oxides of nitrogen (NO_x) emissions by major source category for 1990, 1999, and the end of the maintenance period, 2011. VOC and NO_x are the primary precursors for ozone formation. Emission reductions that occur between 1990 and 1999 are primarily attributable to controls on highway vehicles, electric utility/industrial boilers and industrial VOC sources. Highway vehicle reductions are attributed to a combination of the Federal Motor Vehicle Control Program (FMVCP) (fleet turnover), the automobile test and repair program, stage II controls at service stations and lower gasoline volatility. Continued emission reductions are expected through the maintenance year of 2011 due to the Chapter 145 NOx SIP Call regulations for large boilers and turbines, the highway vehicle control programs including National Low Emission Vehicles (NLEV) and Tier II/low sulfur gasoline rules.

Figure 1: VOC Emissions

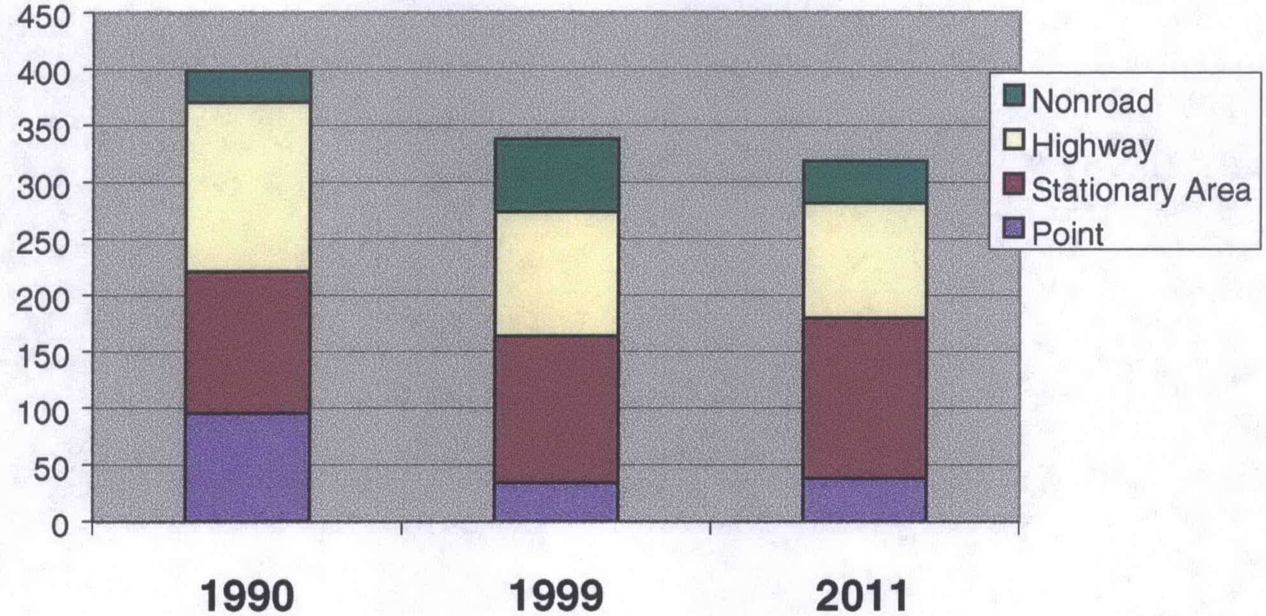
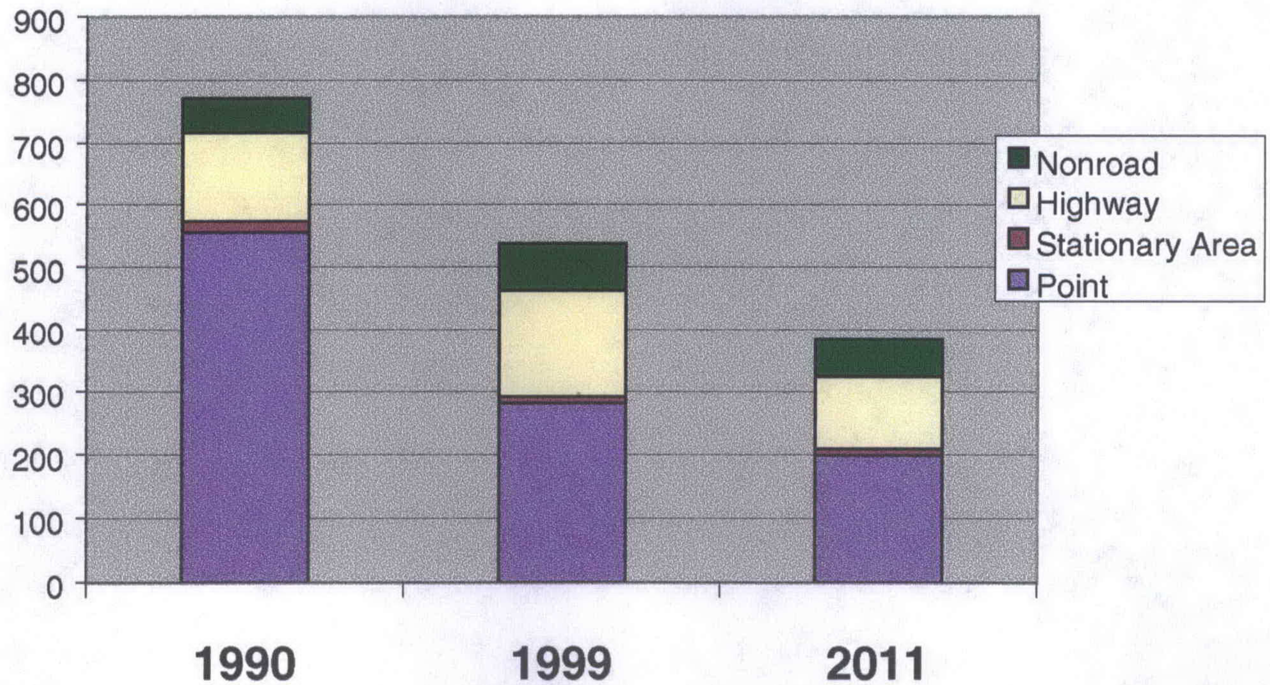


Figure 2: NO_X Emissions



The following are state and federal emission reduction strategies adopted since 1990 that are included in this plan.

Stationary Point Sources

Reasonably Available Control Technology regulations
NOx Memorandum of Understanding rules for utility and industrial boilers
Coke Oven NESHAPS
Prevention of Significant Deterioration review
New Source Review
Section 145 (NOx SIP Call) for utility and industrial boilers

Stationary Area Sources

EPA rules for:

- automobile refinish coatings
- many consumer products
- architectural and industrial maintenance coatings
- wood furniture coatings
- aircraft surface coatings
- marine surface coatings
- metal furniture coatings
- municipal solid waste landfills
- waste treatment, storage and disposal

Additional state regulations on automobile refinishing
Refueling (Stage II) at service stations

Highway Vehicles

Federal Motor Vehicle Control Program including onboard control of evaporative and refueling emissions
Southwestern Pennsylvania gasoline volatility controls
Vehicle emissions inspection/maintenance
National Low Emission Vehicle (NLEV) program
EPA's heavy-duty diesel engine standards (2004 program)
EPA's Tier 2/low sulfur gasoline program for light-duty vehicles

Nonroad Sources

EPA rules for large and small compression-ignition engines
EPA rules for smaller spark-ignition engines
EPA rules for recreational spark-ignition marine engines

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INTRODUCTION

The 1990 Amendments to the Clean Air Act (CAA) authorized EPA to designate ozone nonattainment areas and to classify them according to degree of severity. An area is designated as an ozone nonattainment area if a violation of the NAAQS for ozone has occurred in the past 3 years anywhere in the designated metropolitan statistical area (MSA) or consolidated metropolitan statistical area (CMSA). An ozone nonattainment area can be classified as marginal, moderate, serious, severe, or extreme, depending on the level of violations. Ozone design values are used for classifying areas into attainment and nonattainment categories. The ozone design value is a measure of the maximum ozone concentration expected to occur within an area.

This report constitutes a formal request to EPA to redesignate the Pittsburgh-Beaver Valley Ozone Nonattainment Area to attainment of the ozone NAAQS. The subsequent analyses clearly demonstrate that the ambient air quality in the Pittsburgh-Beaver Valley Nonattainment Area meets the national standards for ozone and the emission reductions responsible for the air quality improvement are both permanent and enforceable. This analysis demonstrates that the Pittsburgh-Beaver Valley Area has completed all criteria set forth in section 107(d)(3)(E) of the CAA and should be officially redesignated as attainment.

Section 107(d)(3)(E) of the CAA, as amended, states that an area can be redesignated to attainment if the following conditions are met:

1. The NAAQS has been attained;
2. The applicable implementation plan has been fully approved under Section 110(k);
3. The improvement in air quality is due to permanent and enforceable reductions in emissions;
4. The State has met all applicable requirements for the area under Section 110 and Part D; and
5. A maintenance plan with contingency measures has been fully approved under Section 175A .

An ambient air quality data analysis was performed that demonstrates that the NAAQS has been achieved within the Pittsburgh-Beaver Valley Area. Fully approved methodologies, as established by EPA, were used to calculate expected exceedances and design values.

Subsequently, a 1990 emissions inventory was compiled for VOC, and NO_x emissions, the primary contributing factors to ozone formation. In addition, 1999 emissions were estimated based on projected economic activity as part of the maintenance plan. This analysis supports the contention that contributing emissions are declining, which will likely lead to further reductions in ambient ozone levels.

Pennsylvania's State Implementation Plan (SIP) should be fully approved by the time the Pittsburgh-Beaver Valley Area is redesignated as attainment. At the present time, approval actions on remaining SIP modifications are currently being completed. However, since approval actions on SIP elements and the redesignation request may occur simultaneously, this should not delay or preclude the approval of this redesignation request. The ozone levels in the Pittsburgh-Beaver Valley Area are currently below the standard and all of the relevant requirements have been met by the Commonwealth of Pennsylvania.

An analysis of existing and potential control measures was also performed to determine the control options necessary for maintaining present ozone levels and implementing contingency measures in the event of any exceedance.

CHAPTER I
AMBIENT AIR QUALITY DATA ANALYSIS

A. INTRODUCTION

The Pittsburgh-Beaver Valley Ozone Nonattainment Area, established by EPA on November 6, 1991 (56 FR 56694, 1991), includes Allegheny, Armstrong, Beaver, Butler, Fayette, Washington and Westmoreland Counties. The analyses in this redesignation request examine the air quality data monitored in these counties and shows that ozone concentrations are now in attainment with the ozone NAAQS.

The Pittsburgh-Beaver Valley Area has been classified as a moderate nonattainment area for ozone. In order to be classified as moderate, an area must have a design value between 0.138 and 0.160 ppm. The primary years used by EPA for the purposes of establishing ozone designations and classifications were 1987 to 1989. Since that time, the air quality in the Pittsburgh-Beaver Valley Area has improved significantly, and is now in compliance with the established ozone NAAQS. This report shows that, based on the most recent 3-year period of analysis, the ozone design value now meets the 0.12 ppm standard and is expected to remain so in the coming years.

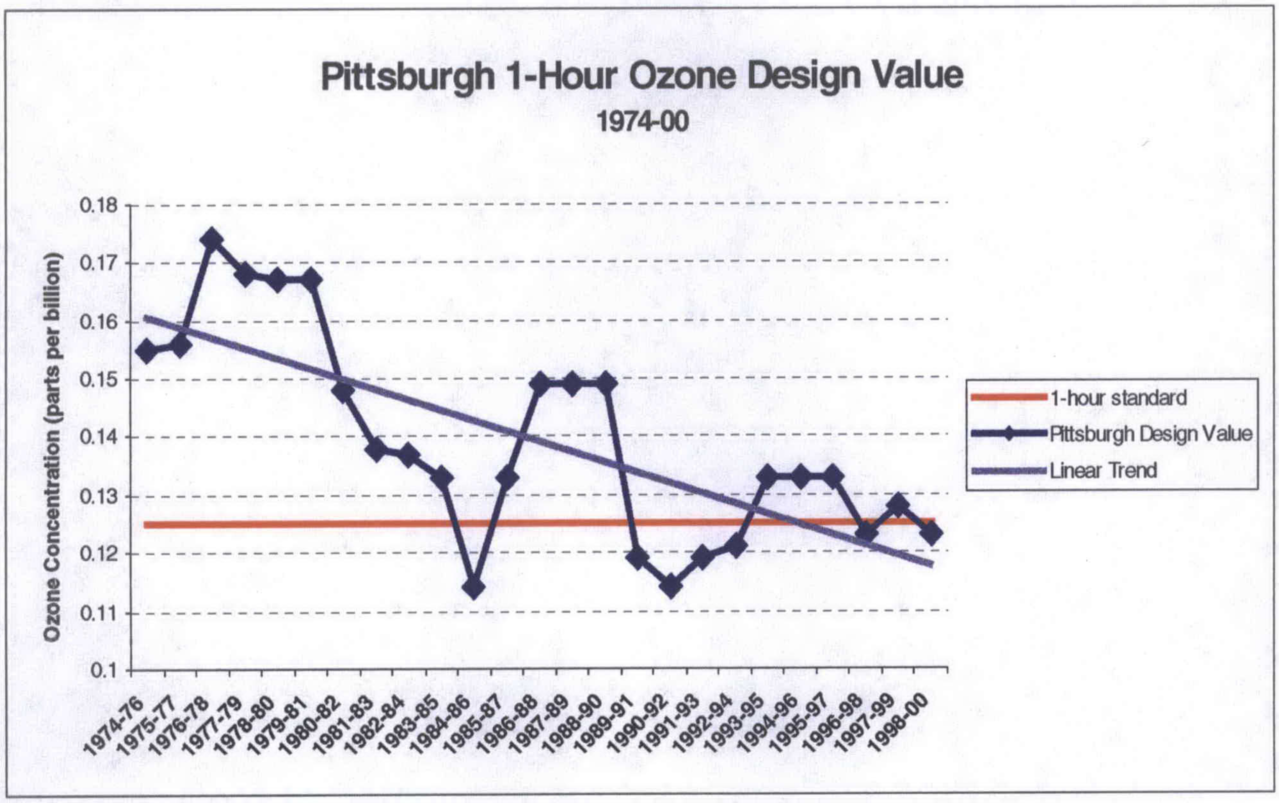
B. DESIGN VALUE DETERMINATION

Ambient ozone data were used to determine the base year and current year ozone design values. The ozone design value during the period from 1987 to 1989 was calculated by EPA to determine the level of nonattainment severity for a given region based on ambient data. The design value is discussed in further detail below. In this analysis, baseline and current year design values were calculated based on data from 1974 to 2000 for each 3-year period. These analyses show that ozone levels declined significantly during this time period.

The ambient air quality analysis is based on ozone data measured at monitoring sites in the Pittsburgh-Beaver Valley Area. There have been a total of 22 ozone monitors operating in the Pittsburgh-Beaver Valley Area during the1974-2000 time period. Of these 22 ozone monitors, only 19 had recording periods long enough to establish a monitor design value (three consecutive years). The number of monitors in the Pittsburgh-Beaver Valley Area has grown from 2 monitors in 1974 to 14 monitors in 2000. Ozone measurements were not taken in Allegheny County (the regions most populated county) until 1978.

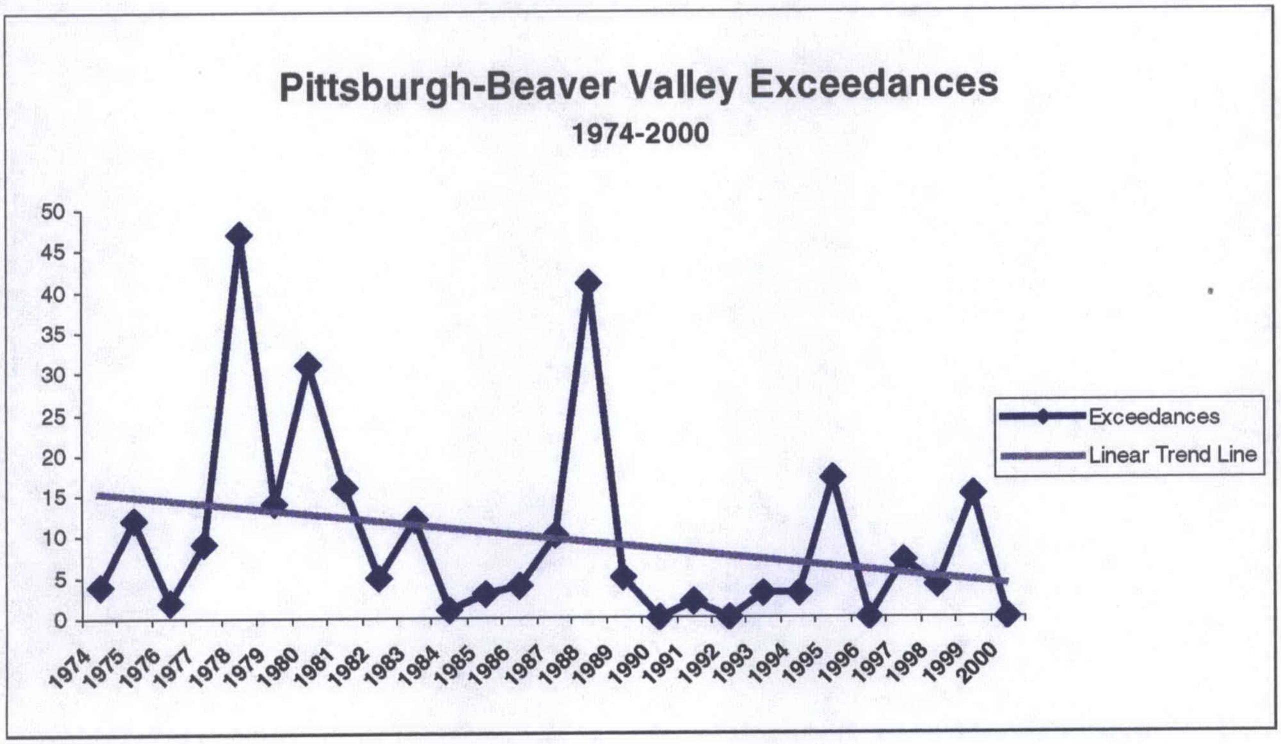
Figure I-1 shows the Pittsburgh-Beaver Valley ozone design value during the 1974-2000 time period. A linear trend line is also depicted on this graph. Design values have decreased substantially over the 1974-2000 time period; decreasing from the 0.150-0.170 ppm range in the mid 70s to just below the NAAQS in 2000. Figure I-2 shows the number of monitor exceedances over the same time period. A linear trend line on this graph shows the number of exceedances has dropped by over 50% during the 1974-2000 time period. It is important to remember that design values and monitor exceedances have declined in spite of increased ozone monitor coverage, including ozone monitors in Allegheny County starting in 1978. Ozone design values along with the monitor defining the design value for the Pittsburgh-Beaver Valley Area are listed in Table I-1. Data from these monitoring sites were used to determine the actual and expected number of exceedances and the ozone design value.

Figure I-1



Pittsburgh 1-Hour Ozone Design Value
1974-00
Ozone Concentration (parts per billion)
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
1974-76
1975-77
1976-78
1977-79
1978-80
1979-81
1980-82
1981-83
1982-84
1983-85
1984-86
1985-87
1986-88
1987-89
1988-90
1989-91
1990-92
1991-93
1992-94
1993-95
1994-96
1995-97
1996-98
1997-99
1998-00
1-hour standard
Pittsburgh Design Value
Linear Trend

Figure I-2



Pittsburgh-Beaver Valley Exceedances
1974-2000
50
45
40
35
30
25
20
15
10
5
0
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Exceedances
Linear Trend Line

Table I-1
Pittsburgh-Beaver Valley Nonattainment Area
Ozone Design Values

Years	Pittsburgh-Beaver Valley DV*	*Design Monitor*	*Number of Monitors*
1974-76	0.155	BADEN	2
1975-77	0.156	BEAVER FALLS	2
1976-78	0.174	BEAVER FALLS	3
1977-79	0.168	BEAVER FALLS	3
1978-80	0.167	LAWRENCEVILLE	5
1979-81	0.167	LAWRENCEVILLE	5
1980-82	0.148	LAWRENCEVILLE	7
1981-83	0.138	BRACKENRIDGE	7
1982-84	0.137	BRACKENRIDGE	7
1983-85	0.133	BRACKENRIDGE	7
1984-86	0.114	MIDLAND	8
1985-87	0.133	BRACKENRIDGE	7
1986-88	0.149	BRACKENRIDGE	7
1987-89	0.149	BRACKENRIDGE	7
1988-90	0.149	BRACKENRIDGE	8
1989-91	0.119	LAWRENCEVILLE	7
1990-92	0.114	LAWRENCEVILLE	9
1991-93	0.119	HARRISON TWP	9
1992-94	0.121	HARRISON TWP	9
1993-95	0.133	HARRISON TWP	8
1994-96	0.133	HARRISON TWP	9
1995-97	0.133	HARRISON TWP	11
1996-98	0.123	CHARLEROI	11
1997-99	0.128	PENN HILLS	12
1998-00	0.123	CHARLEROI	14

* Design values are in parts per million

The ambient air quality data analysis for ozone was completed using the appropriate regulations and guidance documents. Monitoring procedures were determined in accordance with 40 CFR, Part 58 (40 CFR, 1992a). For interpretation and calculation of the expected number of exceedances and the design value, appropriate regulations and corresponding guidance documents were used (EPA, 1979; 40 CFR, 1992b).

As the ozone-monitoring season extends from April 1 through October 31, data were analyzed for this period. Data for the Pittsburgh-Beaver Valley monitoring sites were retrieved from EPA's AIRS air monitoring data system. In determining the validity of an ozone value, the following conditions apply:

1. If the value is greater than the standard, it is valid, regardless of the number of hourly values available for that day.

2. If the value is less than the standard, validity was determined using the criteria below:

   - If data were available for 75 percent of the hours between 9 a.m. and 9 p.m. (i.e., 9 hours), then the daily maximum is valid.

   - If data were available for less than 75 percent of the hours between 9 a.m. and 9 p.m., the daily maximum is considered missing or invalid.

   - For purposes of calculating the expected number of days exceeding the standard, the days with missing or invalid data are further evaluated to determine if they can be assumed to have a daily maximum less than the standard. This is done by looking at the daily maxima from the day before and the day after. If these maxima are valid and less than 75 percent of the standard (i.e., 0.09 ppm), then the daily maximum for the day in question can be assumed to be less than the standard. This methodology does not allow 2 or more consecutive days of missing or invalid data to be assumed to be less than the standard.

The data required to evaluate the ozone levels for the Pittsburgh-Beaver Valley Area are: (1) the number of days exceeding the standard; (2) the expected number of days exceeding the standard; and (3) the ozone design value. The daily maximum ozone limit is 124 parts per billion (ppb), concentrations above which would be considered an exceedance. The number of days exceeding the standard must be less than or equal to 1 per year averaged over a 3-year period for an area to be in attainment with the ozone NAAQS. The expected number of days exceeding the standard takes into account days with incomplete or missing data.

To determine the overall number of days exceeding the standard, the ambient daily ozone levels were examined for each site during the ozone season for the Pittsburgh-Beaver Valley Area (April 1 through October 31). The four highest maximum hourly ozone values for each year were retrieved. Based on the valid data retrieved from the monitoring system, the number of maximum values greater than the standard is used as the number of exceedances.

Subsequent to determining the actual number of exceedances, the **expected** number of exceedances was calculated, taking into account days with missing or invalid data, days with a maximum assumed to be less than the standard, and the total number of days in the ozone monitoring period (i.e., 214 days).

This calculation was performed using the following formula:

$$e=v+[(v/n)*(N-n-z)]$$

where:

e = expected number of exceedances
v = number of days with maxima exceeding the standard
n = number days with valid maxima
N = number of days within the ozone monitoring season (4/1 to 10/31 = 214 days)
z = number of days with a maximum assumed to be less than the standard.

Monitoring sites may have years that are not valid. In order for a year of data at a particular site to be complete or valid, at least 75 percent of the days within the ozone season must have a valid daily maximum. Determining the number of years of complete monitoring is important in determining the expected number of exceedances and the design value for each site. For example, if there is one year within the 3-year period of analysis that is not valid for a specific monitoring site, the expected number of exceedances for the valid years will be calculated by dividing the expected exceedance values by 2 instead of 3, which could significantly increase the overall expected number of exceedances for the period of analysis (EPA, 1979). All monitoring data for the years included in this analysis were complete.

The expected number of exceedances was determined for each year between 1974 and 2000. These annual values were averaged over each of the 3-year periods within this timeframe to obtain an overall value for purposes of determining attainment under the CAA. As Table I-2 shows, the number of exceedances and the expected number of exceedances for the Pittsburgh-Beaver Valley Area were 15 and 19.6 days respectfully in the first 3-year period. These overall values were obtained by averaging the annual values over the 1974 to 1976 time period.

The level of the fourth highest daily maximum over a 3-year period of analysis is considered the "ozone design value," which is used to determine the ozone nonattainment classification. In order to determine the design value, the four highest daily maxima are selected for each year by monitoring site. The values for each site over the 3-year period are ranked from 1 to 12 (i.e., highest to lowest, respectively). By definition, the design value is the daily maximum with the rank equal to the number of years of complete monitoring plus 1. Since all years are valid for the monitoring site, the design value for each 3-year period is the fourth highest valid daily maximum.

Table I-2
Pittsburgh-Beaver Valley Nonattainment Area
Ozone Monitoring Data Summary

Year	Design Monitor	Monitored Exceedances	Expected Exceedances	Average Expected Exceedances per year	Design Value
1974-76	BADEN	15	19.6	6.5	0.155
1975-77	BEAVER FALLS	7	17.2	5.7	0.156
1976-78	BEAVER FALLS	26	39.7	13.2	0.174
1977-79	BEAVER FALLS	25	35.1	11.7	0.168
1978-80	LAWRENCEVILLE	22	27.5	9.2	0.167
1979-81	LAWRENCEVILLE	14	18.2	6.1	0.167
1980-82	LAWRENCEVILLE	8	10.3	3.4	0.148
1981-83	BRACKENRIDGE	11	13.2	4.4	0.138
1982-84	BRACKENRIDGE	8	8.7	2.9	0.137
1983-85	BRACKENRIDGE	7	7.3	2.4	0.133
1984-86	MIDLAND	2	2.5	0.8	0.114
1985-87	BRACKENRIDGE	5	5.1	1.7	0.133
1986-88	BRACKENRIDGE	18	19.9	6.6	0.149
1987-89	BRACKENRIDGE	19	20.9	7.0	0.149
1988-90	BRACKENRIDGE	15	16.8	5.6	0.149
1989-91	LAWRENCEVILLE	2	2	0.7	0.119
1990-92	LAWRENCEVILLE	1	1	0.3	0.114
1991-93	HARRISON TWP	2	2.1	0.7	0.119
1992-94	HARRISON TWP	2	2	0.7	0.121
1993-95	HARRISON TWP	9	9	3.0	0.133
1994-96	HARRISON TWP	8	8	2.7	0.133
1995-97	HARRISON TWP	10	10	3.3	0.133
1996-98	CHARLEROI	3	3	1.0	0.123
1997-99	PENN HILLS	4	4	1.3	0.128
1998-00	CHARLEROI	3	3	1.0	0.123

The average number of actual and expected exceedances, and the design values are presented in Table I-2 for each 3-year period from 1974 to 2000. For the base year determination (1987-89), the design value is 0.149 ppm. Since this value is above the NAAQS, the Pittsburgh-Beaver Valley Area was classified as a moderate ozone nonattainment area. Design values and ozone exceedances have declined since Pennsylvania first collected data in 1974. As noted in Table I-2 and Figure I-1 design values in the Pittsburgh-Beaver Valley Area are now currently below the NAAQS. The average number of expected exceedances has dropped from 7.0 for the 1987-1989 original designation 3-year period to 1.0 for the most recent period.

C. AMBIENT MONITORING ISSUES

1. Monitoring Sites

Twenty-two (22) ozone monitors have operated in the Pittsburgh-Beaver Valley Area during the 1974-2000 time period. Of these 22 monitors, only 19 had sufficient data (three consecutive years) to calculate ozone design values. Currently, there are 14 monitors operating in the Pittsburgh-Beaver Valley Area. In 1974 there were 2 ozone monitors operating in the Pittsburgh-Beaver Valley Area, and none in Allegheny County (the area's most populated county).

2. Climatic Trends

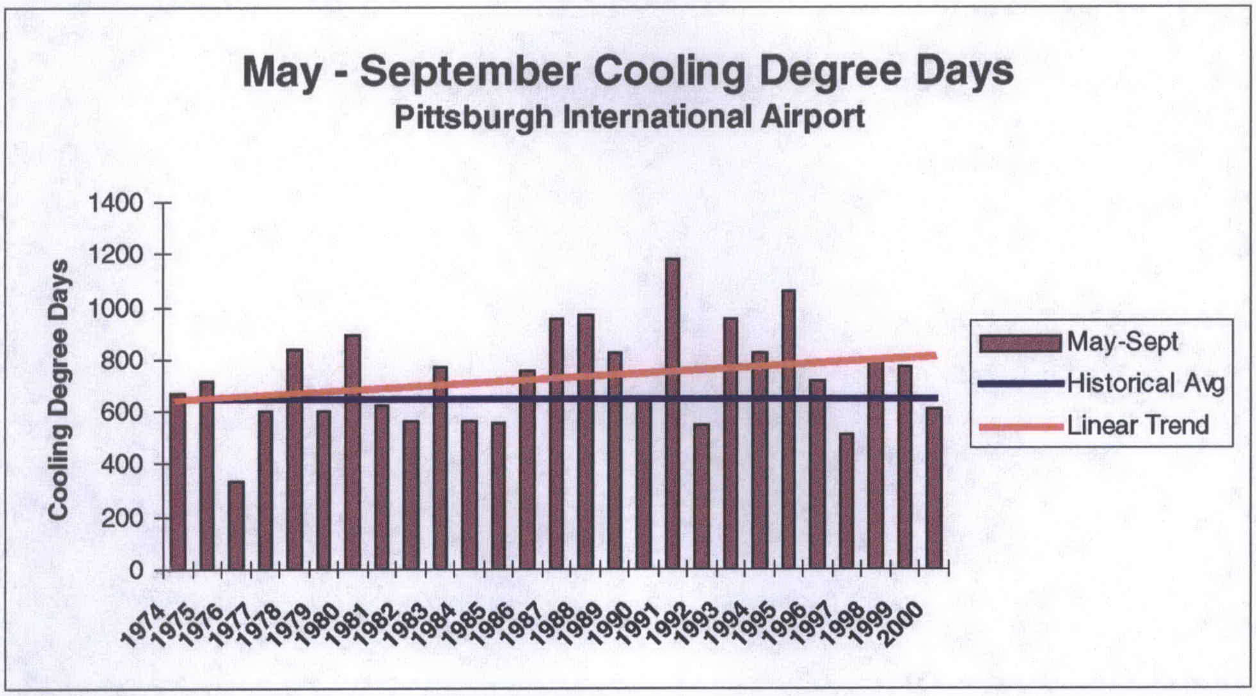
Climate can impact ozone concentrations in a particular area. Since ground-level ozone is a product of photochemical reactions, increases in sunlight intensity and temperatures can intensify ozone formation. To gauge the possible effects of climate on the Pittsburgh-Beaver Valley Area ozone exceedances and design values, climate trends at the Pittsburgh International Airport were examined. Several meteorological variables were examined to determine climate trends over the 1974-2000 time period. These included cooling degree-days, average monthly temperatures, 90° days (days in which max temperatures were ≥90°F), and precipitation. Climate data for the months of May through September were examined to coincide with the summer months when ozone concentrations are the highest.

Climate trend results for the Pittsburgh International Airport site indicate conditions conductive to producing high ozone concentrations (warm temperatures and clear skies) were more common in recent years than in the 1970's and 80's. All of the climate variables we reviewed, with the exception of precipitation, showed a general upward trend over time. This indicated conditions favorable for ozone formation were more likely to occur recently than in the past. Ozone trends in Pittsburgh-Beaver Valley Area, however, show exceedances and ozone design values decreasing over the same time period. This decline occurred even as the ozone-monitoring network became more enhanced. In short, ozone exceedances and design values have decreased in the Pittsburgh-Beaver Valley Area even though regional climatology has favored enhanced ozone production over the last decade. It is therefore likely that local emission control programs in the Pittsburgh-Beaver Valley Area are responsible for the decline in ozone exceedances and design values during the 1974-2000 time period.

a. Cooling Degree Days

Figure I-3 presents the number of cooling degree-days during the study period (1974-2000) along with a linear trend line and long-term average for the Pittsburgh International Airport. The figure shows cooling degree-days have generally increased over the study period. Cooling degree days gauge how warm a particular time period is, the higher the cooling degree number the warmer the time period. The recent increase in the cooling degree-days in the Pittsburgh-Beaver Valley Area contrasts with declining ozone exceedances and design values occurring over the same time period.

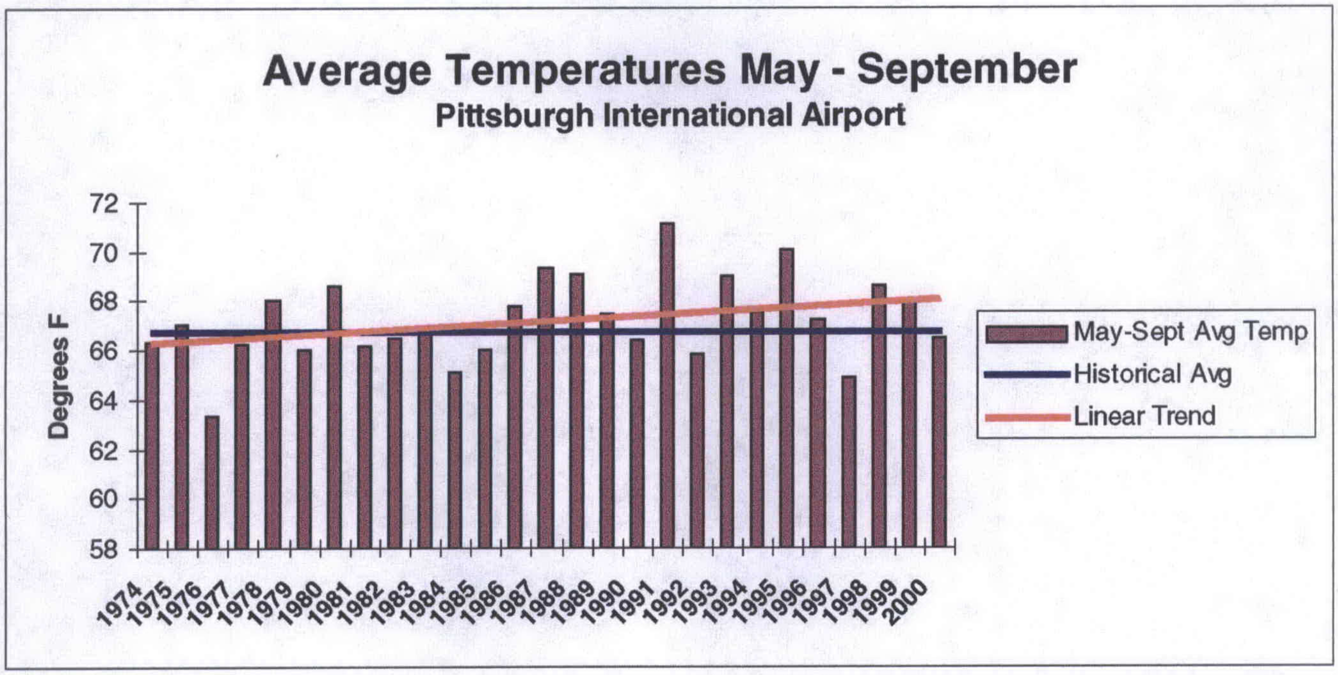
Figure I-3


May - September Cooling Degree Days
Pittsburgh International Airport
Cooling Degree Days
1400
1200
1000
800
600
400
200
0
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
May-Sept
Historical Avg
Linear Trend

b. Mean Temperature

Figure I-4 presents the average ozone season (May through September) temperatures at Pittsburgh International Airport from 1974 to 2000. Also included in this graph is the long-term average along with a linear trend line. Average temperatures for the 1974-2000 time period appear to be below the long-term average, though the temperature trend appears to be increasing. This temperature trend is consistent with the cooling degree trend. Both trends contrast with downward trends in ozone exceedances and design values in the Pittsburgh-Beaver Valley Area.

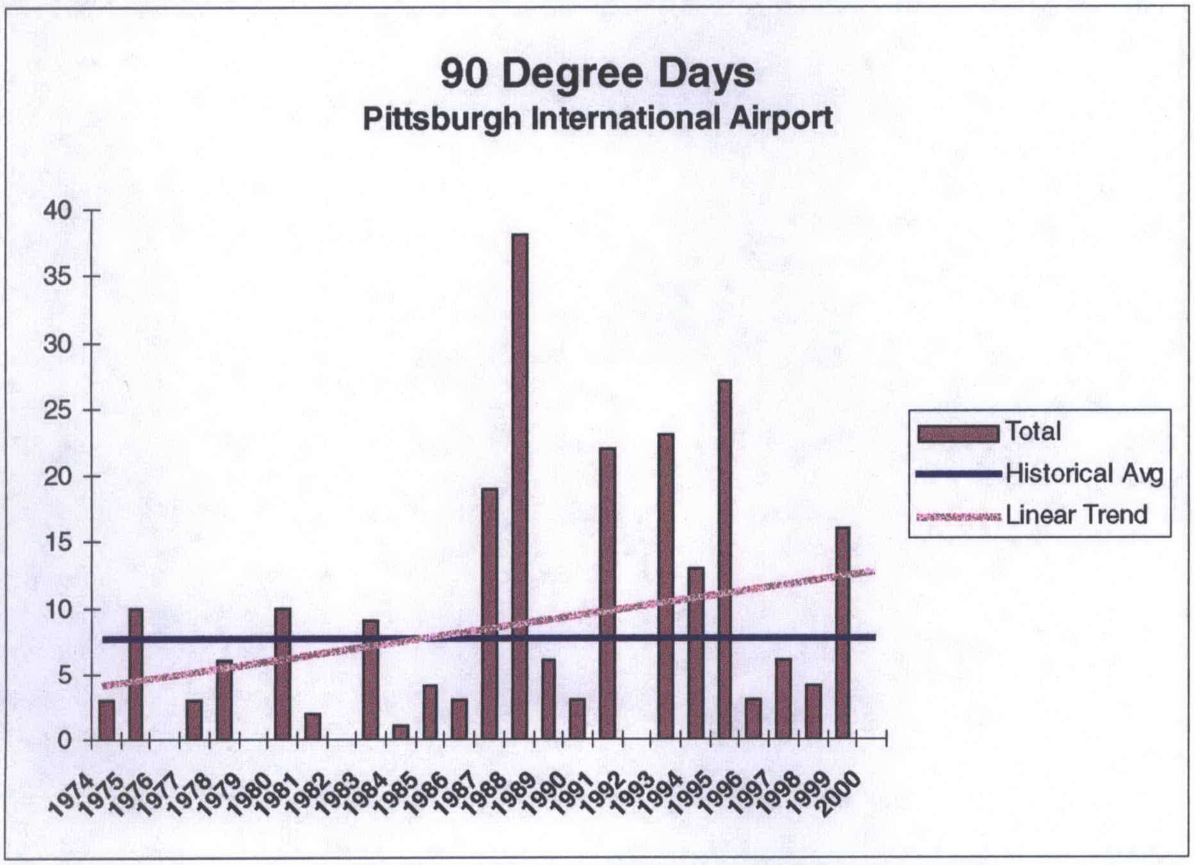
Figure I-4



c. 90 Degree Days

Figure I-5 shows the number of 90° days (days in which max temperatures are ≥90° F) at Pittsburgh International Airport during the study period. The number of 90°days is another measure of how warm a particular summer is. Also included in the graph are a linear trend line and the long-term average for the Pittsburgh International Airport. The data indicate a general increase in the number of 90°days over the study period. This upward trend is similar to trends observed in the cooling degree day and average temperature data, and opposite the trends observed in the ozone exceedance and design value data for the Pittsburgh-Beaver Valley Area.

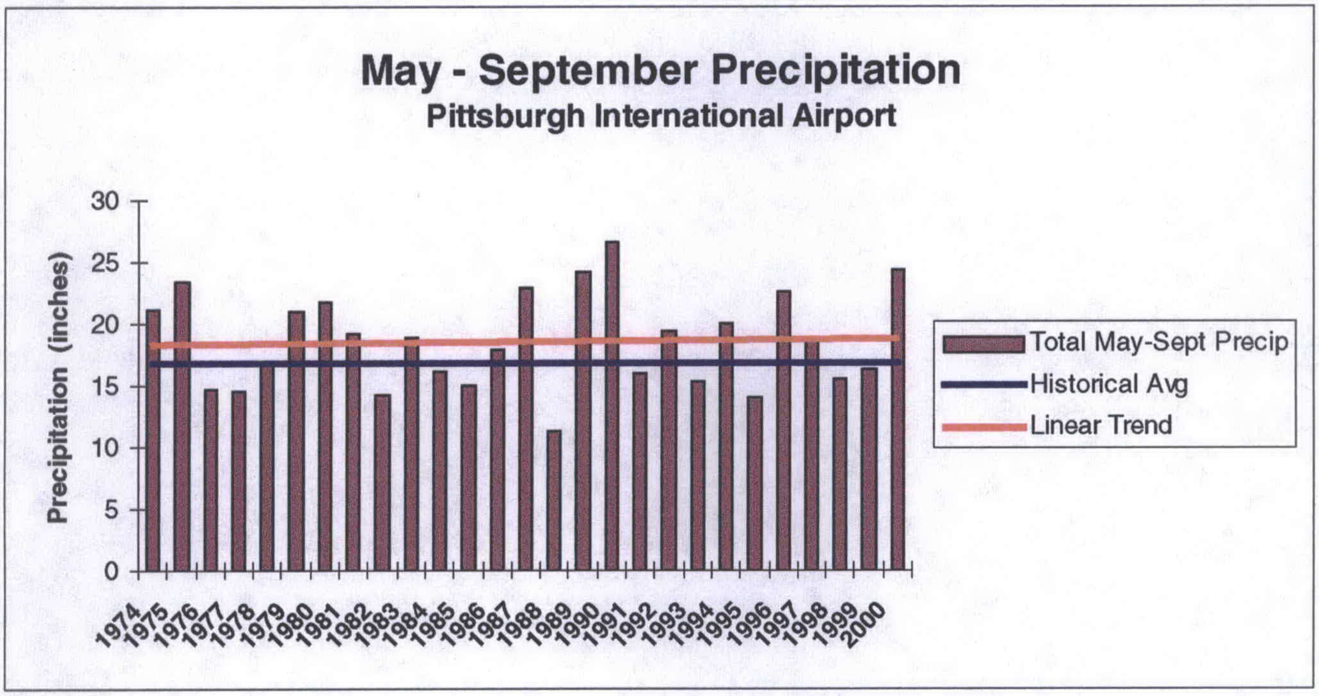
Figure I-5



d. Precipitation

Figure I-6 shows ozone season (May-September) precipitation at Pittsburgh International Airport during the study period. A linear trend line along with a long-term average is also shown on the graph. Summers with below average precipitation are more prone to having days with enhanced ozone production (less cloudy days). Dry summers also tend to be warmer than average, further increasing the likelihood of enhanced ozone production. Precipitation trends appear to be relatively unchanged during the study period.

Figure I-6



e. Climate Indexing

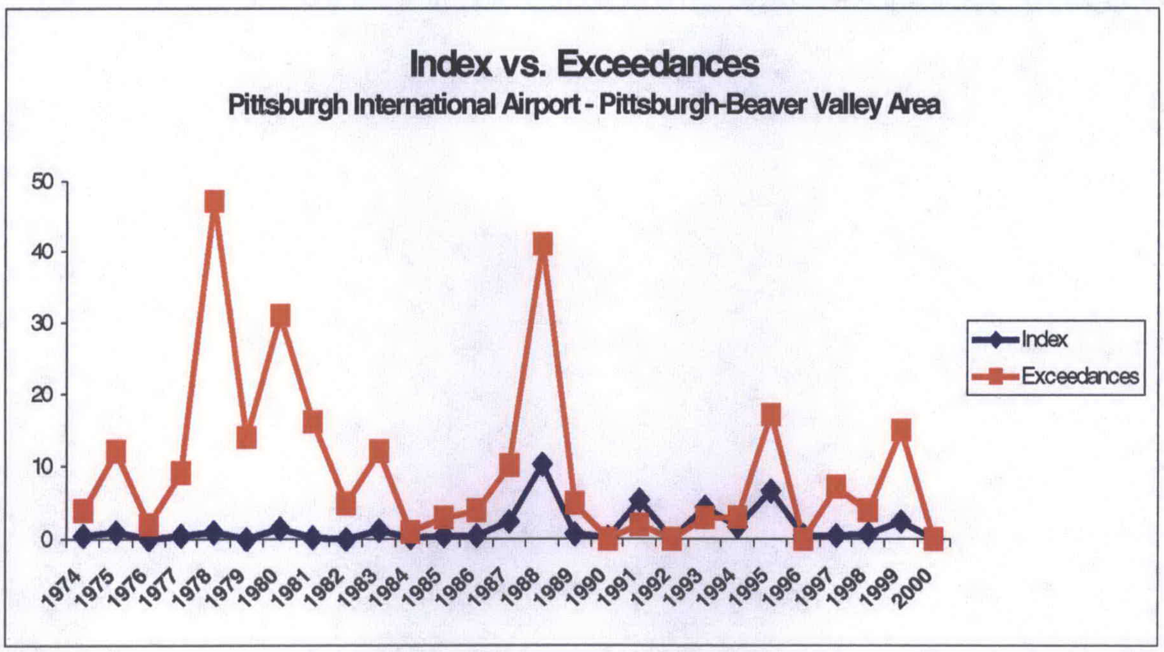
A number of climate variables have been reviewed in this chapter including cooling degree days, average temperatures, 90° days, and precipitation. All of these variable have some influence on ozone concentrations over the ozone season. Indexing attempts to encompass all of the information reviewed into one number so that different years can be compared with one another in a simplified way. The index developed in this study encompasses all of the climate variable reviewed previously and compares them with seasonal averages. The index is defined as follows:

$$I = \frac{[(90°\text{days}+1)_i\,(\text{Avg Temperature})_i\,(\text{Cooling Degree Days})_i\,/\,(\text{Precipitation})_i}{[(90°\text{days}+1)_{avg}\,(\text{Avg Temperature})_{avg}\,(\text{Cooling Degree Days})_{avg}\,/\,(\text{Precipitation})_{avg}}$$

where $(....)_i$ = year i value,
$(....)_{avg}$ = long-term average and
I = index

Figure I-7 shows index values for the Pittsburgh International Airport along with ozone exceedances in the Pittsburgh-Beaver Valley Area over the 1974-2000 time period. Index numbers appear to confirm conditions favorable for ozone formation occurred quite frequently in the last decade. Exceedances appear to be following fluctuations in the index during this time period. Prior to the mid 80s the index shows no year that is comparable to what was observed in the late 80s or 90s, though there are large peaks in monitor exceedances. This suggests that during the 70s and early 80s exceedances were caused by large anthropogenic emissions and as emissions have been reduced exceedances have aligned more with climatic forcing.

Figure I-7



CHAPTER II
EMISSIONS INVENTORY

This chapter provides an assessment of the ozone precursor emissions at the time the Pittsburgh-Beaver Valley Area was originally designated as nonattainment for ozone, and at the time when this Area measured attainment of the ozone one-hour average NAAQS. A 1990 inventory of VOC and NO_x emissions is used to represent emissions during the ozone nonattainment designation period (the base year). An estimate of 1999 VOC and NO_x emissions for the Pittsburgh-Beaver Valley Area is used for ozone precursor emissions during the period when the Pittsburgh-Beaver Valley Area demonstrated that it attained the 1-hour ozone NAAQS. This chapter describes these 1990 and 1999 ozone precursor emissions. Then, it presents information about the permanent and enforceable control measures that have been implemented in Pittsburgh-Beaver Valley Area to produce the VOC and NO_x emission reductions that have occurred between 1990 and 1999.

In 1996, the Commonwealth convened the Southwest Pennsylvania Ozone Stakeholder Working Group to develop a course of action for the attainment and maintenance of the one-hour ozone standard, tailored to meet the regional needs of the area. The group presented its recommendations in January 1997. The immediate recommendations of the group including NOx reductions from large boilers, an improved vehicle emission inspection/maintenance program, Stage II vapor recovery systems for gasoline stations and cleaner gasoline have been adopted and included in the emissions inventory for 1999 as appropriate. The Commonwealth has implemented these and other ozone reduction strategies as presented in this plan.

A. BASE YEAR (1990) EMISSION ESTIMATES

A base year emissions inventory for 1990 was developed in accordance with EPA guidance. Table II-1 shows the combined listing of stationary point and area source (stationary area, nonroad and highway) emissions for 1990 by source category. These 1990 emission estimates for the Pittsburgh-Beaver Valley Area are the same as those provided earlier to EPA by the Pennsylvania DEP as the revised SIP emission inventory for 1990 which was submitted on March 22, 1996 and supplemented on February 18, 1997.

TABLE II-1: Summary of 1990 Emissions (ozone season tons/day)

	Point Source		Area Source		Total	
Tier 2 Category	VOC	NO_x	VOC	NO_x	VOC	NO_x
Fuel Comb. Elec. Utility						
Coal	1.52	444.26	0.00	0.00	1.52	444.26
Oil	0.00	0.19	0.00	0.00	0.00	0.19
Gas	0.00	0.06	0.00	0.00	0.00	0.06
Internal Combustion	0.44	18.02	0.00	0.00	0.44	18.02
Fuel Comb. Industrial						
Coal	0.09	27.16	0.00	0.00	0.09	27.16
Oil	0.00	0.43	0.00	0.00	0.00	0.43
Gas	0.41	20.99	0.00	0.00	0.41	20.99
Other	0.00	0.45	0.00	0.00	0.00	0.45
Internal Combustion	0.01	0.03	0.00	0.00	0.01	0.03
Fuel Comb. Other						
Commercial/Institutional Coal	0.00	0.76	0.00	0.00	0.00	0.76
Commercial/Institutional Oil*	0.00	0.01	0.07	2.06	0.07	2.07
Commercial/Institutional Gas*	0.00	0.86	0.59	11.27	0.59	12.13
Other Non-Residential	0.00	0.54	0.00	0.00	0.00	0.54
Residential Coal	0.00	0.00	0.01	2.16	0.01	2.16
Chemical & Allied Product Mfg						
Organic Chemicals	0.54	0.15	0.00	0.00	0.54	0.15
Polymers & Resins	6.40	0.12	0.00	0.00	6.40	0.12
Agricultural Chemicals	0.48	2.54	0.00	0.00	0.48	2.54
Paints, Varnishes, Lacquers, Enamels	2.02	0.00	0.00	0.00	2.02	0.00
Other Chemicals	0.63	0.00	0.00	0.00	0.63	0.00
Metals Processing						
Non-Ferrous Metals Processing	0.05	0.43	0.00	0.00	0.05	0.43
Ferrous Metals Processing	63.60	21.30	0.00	0.00	63.60	21.30
Not Elsewhere Classified	1.05	0.26	0.00	0.00	1.05	0.26
Petroleum & Related Industries						
Petroleum Refineries & Related Industries	0.07	0.00	0.00	0.00	0.07	0.00
Asphalt Manufacturing	0.49	0.77	0.00	0.00	0.49	0.77
Other Industrial Processes						
Agriculture, Food, & Kindred Products	0.15	0.00	1.31	0.00	1.46	0.00
Rubber & Miscellaneous Plastic Products	0.15	0.00	0.00	0.00	0.15	0.00
Mineral Products	1.27	14.29	0.00	0.00	1.27	14.29
Fabricated Metals	0.01	0.80	0.00	0.00	0.01	0.80
Miscellaneous Industrial Processes	0.10	0.04	0.00	0.00	0.10	0.04
Solvent Utilization						
Degreasing	0.58	0.00	11.60	0.00	12.18	0.00
Graphic Arts	0.95	0.00	1.67	0.00	2.62	0.00
Dry Cleaning	0.00	0.00	0.51	0.00	0.51	0.00
Surface Coating	6.82	0.18	42.78	0.00	49.60	0.18

Tier 2 Category	Point Source		Area Source		Total	
	VOC	NO_x	VOC	NO_x	VOC	NO_x
Other Industrial	0.46	0.00	0.00	0.00	0.46	0.00
Nonindustrial	0.00	0.00	24.84	0.00	24.84	0.00
Storage & Transport						
Bulk Terminals & Plants	1.29	0.00	0.00	0.00	1.29	0.00
Petroleum & Petroleum Product Storage	1.70	0.00	0.04	0.00	1.74	0.00
Petroleum & Petroleum Product Transport	0.50	0.00	0.16	0.00	0.66	0.00
Service Stations: Stage I	0.07	0.00	4.30	0.00	4.37	0.00
Service Stations: Vehicle Refueling	0.00	0.00	16.80	0.00	16.80	0.00
Service Stations: Breathing Losses	0.00	0.00	1.44	0.00	1.44	0.00
Organic Chemical Storage	2.97	0.00	0.00	0.00	2.97	0.00
Organic Chemical Transport	0.38	0.00	0.00	0.00	0.38	0.00
Bulk Materials Storage	0.02	0.10	0.00	0.00	0.02	0.10
Waste Disposal & Recycling						
Incineration	0.18	0.29	0.93	0.93	1.11	1.22
Open Burning	0.00	0.00	1.02	1.19	1.02	1.19
POTW	0.30	0.00	3.22	0.00	3.52	0.00
TSDF	0.00	0.00	12.48	0.00	12.48	0.00
Landfills	0.01	0.05	0.07	0.00	0.08	0.05
Highway Vehicles						
Light-Duty Gas Vehicles & Motorcycles	0.00	0.00	130.79	108.78	130.79	108.78
Light-Duty Gas Trucks	0.00	0.00	14.40	13.55	14.40	13.55
Heavy-Duty Gas Vehicles	0.00	0.00	2.28	2.27	2.28	2.27
Diesels	0.00	0.00	2.53	19.89	2.53	19.89
Off-Highway						
Non-Road Gasoline	0.00	0.00	19.66	25.06	19.66	25.06
Aircraft	0.00	0.00	5.97	2.08	5.97	2.08
Railroads	0.00	0.00	2.03	26.93	2.03	26.93
Miscellaneous						
Other Combustion	0.00	0.00	1.54	0.20	1.54	0.20
Health Services	0.06	0.00	0.00	0.00	0.06	0.00
Totals	**95.77**	**555.08**	**303.04**	**216.37**	**398.81**	**771.45**

NOTE: *Area source fuel combustion was not inventoried by sector and was therefore summarized under the Commercial/Institutional category.

Source Category	Point Source VOC	Point Source NO_x	Area Source VOC	Area Source NO_x	Total VOC	Total NO_x
Electronic Equipment	0.04	0.00	0.00	0.00	0.04	0.00
Miscellaneous Industrial Processes	0.20	0.04	0.00	0.00	0.20	0.04
Solvent Utilization						
Degreasing	1.28	0.00	20.32	0.00	21.60	0.00
Graphic Arts	0.14	0.01	6.67	0.00	6.81	0.01
Dry Cleaning	0.25	0.00	0.51	0.00	0.76	0.00
Surface Coating	2.59	0.02	47.84	0.00	50.43	0.02
Other Industrial	1.20	0.00	0.00	0.00	1.20	0.00
Nonindustrial	0.00	0.00	29.41	0.00	29.41	0.00
Storage & Transport						
Bulk Terminals & Plants	0.69	0.00	0.00	0.00	0.69	0.00
Petroleum & Petroleum Product Storage	1.37	0.00	0.00	0.00	1.37	0.00
Petroleum & Petroleum Product Transport	0.44	0.01	0.16	0.00	0.60	0.01
Service Stations: Stage I	0.00	0.00	0.43	0.00	0.43	0.00
Service Stations: Stage II	0.00	0.00	6.63	0.00	6.63	0.00
Service Stations: Breathing & Emptying	0.00	0.00	1.47	0.00	1.47	0.00
Organic Chemical Storage	0.71	0.00	0.00	0.00	0.71	0.00
Organic Chemical Transport	0.07	0.00	0.00	0.00	0.07	0.00
Inorganic Chemical Storage	0.00	0.00	0.00	0.00	0.00	0.00
Bulk Materials Storage	0.01	0.21	0.00	0.00	0.01	0.21
Waste Disposal & Recycling						
Incineration	0.00	0.00	3.29	1.24	3.29	1.24
Open Burning	0.00	0.00	5.30	1.06	5.30	1.06
POTW	0.06	0.00	5.21	0.00	5.27	0.00
Industrial Waste Water	0.13	0.00	0.00	0.00	0.13	0.00
TSDF	0.00	0.00	0.25	0.00	0.25	0.00
Landfills	0.18	0.25	1.04	0.00	1.22	0.25
Other	0.00	0.00	0.00	0.00	0.00	0.00
Highway Vehicles						
Light-Duty Gas Vehicles & Motorcycles	0.00	0.00	61.43	66.89	61.43	66.89
Light-Duty Gas Trucks	0.00	0.00	36.54	40.05	36.54	40.05
Heavy-Duty Gas Vehicles	0.00	0.00	6.14	10.87	6.14	10.87
Diesels	0.00	0.00	5.54	53.24	5.54	53.24
Off-Highway						
Non-Road Gasoline	0.00	0.00	54.44	4.49	54.44	4.49
Non-Road Diesel	0.00	0.00	9.64	64.13	9.64	64.13
Miscellaneous	0.00	0.00	0.01	6.65	0.01	6.65
Miscellaneous						
Other Combustion	0.00	0.00	0.05	0.01	0.05	0.01
Health Services	0.00	0.00	0.00	0.00	0.00	0.00
Cooling Towers	0.00	0.00	0.00	0.00	0.00	0.00
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00
Totals	**34.26**	**282.81**	**303.52**	**256.07**	**337.78**	**538.18**

Table II-3
Input Values for Pittsburgh-Beaver Valley Area NONROAD Model Run

Parameter	Input Value
Fuel RVP, psi	8.8
Oxygen Weight %	0%
Gasoline Sulfur	0.03%
Diesel Sulfur	0.33%
Liquefied Petroleum Gas/Compressed Natural Gas Sulfur	0%
Minimum Temperature, °F	67
Maximum Temperature, °F	96
Average Ambient Temperature, °F	86

Table II-4
Recreational Marine Equipment Populations, 1999

SCC	SCC Description	State	Pittsburgh -Beaver Valley Area
2282005010	Mobile Sources Marine Vessels, Recreational Pleasure Craft, Gasoline 2-Stroke Outboards	246,851	6,850
2282005015	Mobile Sources Marine Vessels, Recreational Pleasure Craft, Gasoline 2-Stroke Sterndrive	33,370	926
2282010005	Mobile Sources Marine Vessels, Recreational Pleasure Craft, Gasoline 4-Stroke Inboards	51,613	1,432
2282020005	Mobile Sources Marine Vessels, Recreational Pleasure Craft, Diesel Inboards	5,292	151
2282020010	Mobile Sources Marine Vessels, Recreational Pleasure Craft, Diesel Outboards	71	2
Total		**337,197**	**9,361**

a. Reasonably Available Control Technology Regulations (RACT) and NOx MOU Phase II Rules

NO_x and VOC emissions from point sources are affected by RACT limits for major stationary sources established by Chapter 129.91 through 129.95 of the Pennsylvania Code (Title 25. Environmental Protection). Case-by-case RACT determinations were made, and any new control equipment installed by 1999. Further, Phase II of the NO_x Memorandum of Understanding requires certain sources (those with design capacities of 250 million British thermal units or more) to meet Phase II NO_x limits in 1999 (OTC, 1994). The reductions associated with the Phase II NO_x allowances are included in the 1999 emission estimates.

b. NESHAPS

Federal regulations under the National Emission Standards for Hazardous Air Pollutants (NESHAPS) covering by-product coke oven benzene emissions reduced VOC emissions as discussed in Pennsylvania's 15% Rate of Progress Plan.

c. Prevention of Significant Deterioration

The Clean Air Act established a program to review the impact that major new sources of air pollution would have on an area. The Prevention of Significant Deterioration (PSD) program requires new sources to implement Best Available Control Technology and conduct specific reviews to determine the new source's impact on the environment. Pennsylvania's PSD program was approved by EPA on August 21, 1984 (49 FR 33128).

d. New Source Review

New Source Review (NSR) is a permitting program that applies to new sources locating in nonattainment areas. The regulations require sources of NO_x and VOC to install lowest achievable emission reduction (LAER) control equipment and obtain offsets. Offsets are emission reductions that occur at another source. The new source must obtain offsets at a rate of 1.15 tons of offsets for each 1 ton of potential emissions from the new source. Thus, overall emissions in the region would be reduced by this program. Pennsylvania's NSR program was approved by EPA on December 9, 1997 (62 FR 64722).

2. Stationary Area Source Control Measures

There are a number of national rules and State regulations affecting area source VOCs that contributed to the emission reductions that occurred between 1990 and 1999. These include rules affecting the following source categories: automobile refinish coatings, consumer products, architectural and industrial maintenance (AIM) coatings, wood furniture coating, aircraft surface coating, and marine surface coating.

a. Automobile Refinish Coatings

Provisions of national VOC emission standards for automobile refinish coatings apply to automobile refinish coatings and coating components manufactured on or after January 11, 1999 for sale and distribution in the United States. It is estimated in this analysis that the national rule will be fully effective during the 1999 ozone season. A 37 percent reduction in VOC emissions is estimated.

b. Consumer Products

Provisions of national VOC emission standards for consumer products apply to consumer products manufactured or imported on or after December 10, 1998 for sale or distribution in the United States. This rule applies to a variety of consumer products including adhesives, household products, and personal care products. This national rule was fully effective during the 1999 ozone season. This VOC reduction is estimated to be 0.8 pounds per capita annually, or a 20 percent control efficiency with a 48.6 percent rule penetration, consistent with a 1995 memorandum from John Seitz, and the rule penetration assumption used in the OTC model rule analysis (Seitz, 1995).

c. Architectural and Industrial Maintenance Coatings

Provisions of national VOC emission standards for architectural and industrial maintenance coatings apply to each architectural coating manufactured on or after September 13, 1999 for sale or distribution in the United States. For any architectural coating registered under the Federal Insecticide, Fungicide, and Rodenticide Act, the provisions of this subpart apply to any such coating manufactured on or after March 13, 2000 for sale or distribution in the United States. The VOC limits do not apply to:

1. Coatings to be sold outside the United States.
2. A coating that is manufactured prior to September 13, 1999.
3. A coating that is sold in a nonrefillable aerosol container.
4. A coating that is collected and redistributed at a paint exchange.
5. A coating that is sold in a container with a volume of one liter or less.

For all area source categories affected by the architectural coatings rule, less than 100 percent compliance was estimated for the 1999 ozone season because the national rule was not fully effective then. EPA allowed States to claim a 15 percent reduction in architectural and industrial maintenance (AIM) coatings VOC emissions in their 1996 rate-of-progress plans, so that 15 percent value is applied in this analysis for 1999 emission estimates.

d. Wood Furniture Coating

In December 1995, EPA promulgated a Title III standard to control hazardous air pollutant (HAP) emissions from wood furniture coating (60 FR 62930, 1995). The four basic wood furniture manufacturing operations that are included in the affected emission source are: finishing, gluing, cleaning, and washoff operations. EPA estimated that the Wood Furniture Finishing MACT standard would reduce volatile HAP emissions by approximately 60 percent. In May 1996, EPA issued the final Control Techniques Guideline (CTG) document for control of VOC emissions from wood furniture manufacturing operations. EPA estimated that the application of presumptive RACT by facilities in ozone nonattainment areas and the ozone transport region would lead to a 31 percent reduction from current levels in VOC emissions from the wood furniture industry (EPA, 1996). In this analysis, a 30 percent VOC control efficiency was applied.

e. Aircraft Surface Coating

EPA promulgated the Aerospace Manufacturing National Emission Standard for Hazardous Air Pollutants (NESHAP) on September 1, 1995 (60 FR 45948, 1995). The final rule affects over 2,800 major source facilities that produce or repair aerospace vehicles or vehicle parts, such as airplanes, helicopters, and missiles (EPA, 1995). The rule was estimated to lead to a reduction in HAP emissions, many of which are also VOCs, by 60 percent, by 1998. A 60 percent VOC reduction is applied in this analysis.

f. Marine Surface Coating

In December 1995, EPA issued a NESHAP for shipbuilding and ship repair based on the maximum HAP limits for 23 types of marine coatings. To comply with the NESHAP, affected facilities may not apply any marine coating with a HAP content in excess of the applicable limit, and are required to implement the work practices specified in the rule. Most, if not all, existing *major source* shipyards are located in ozone nonattainment areas, and will have to control VOC emissions under Title I in addition to Title III (EPA, 1994). EPA developed the CTG for this source category in parallel with the NESHAP because of the overlap involving coating limits. The controls required for complying with the NESHAP also apply to VOCs, and constitute draft recommended best available control measures. A 24 percent VOC reduction is applied in this analysis (Serageldin, 1994) which is consistent with EPA estimates.

g. Treatment Storage and Disposal Facilities

Phase II Federal standards for facilities that manage hazardous wastes containing VOC's were promulgated by EPA on December 8, 1997. This results in a 94% reduction with a rule effectiveness of 80%.

h. Refueling Controls (Stage II)

Pennsylvania implemented a Stage II refueling program in the area. This program required vapor recovery nozzles on gasoline pumps which ensure that the gasoline vapors from the filling of motor vehicle gasoline tanks are collected and returned to the service station's storage tanks. This program was effective for 120,000 gallon per month stations and new stations starting in 1999. Emission reduction credit was therefore only taken for 44 percent of gasoline sales in the area.

3. Highway Vehicles

Even with the increase in VMT that occurred from 1990 to 1999, highway vehicle emissions of VOC decreased by 27 percent from 1990 to 1999, while NO_x emissions increased by 27 percent over the same time period using the old 1990 baseline data. Using the updated techniques consistent with the 1999 techniques, as shown previously in Table II-5 would show a VOC reduction of 38% and a NO_x reduction of 18%. These reductions can be attributed to a combination of the FMVCP (fleet turnover), the enhanced auto emissions testing program and lower gasoline volatility.

a. Federal Motor Vehicle Control Program (FMVCP)

The emission reductions from the FMVCP covering fleet turnover are permanent reductions. The effects of fleet turnover will continue to bring about significant reductions in highway vehicle emissions

Tier 1 tailpipe standards established by the CAA Amendments of 1990 include NO_x, VOC, and CO limits for light-duty gasoline vehicles (LDGVs) and light-duty gasoline trucks (LDGTs). These standards began to be phased in starting in 1994. NO_x standards are also specified for heavy-duty gasoline and diesel vehicles.

Evaporative VOC emissions has also been reduced in gasoline-powered cars as new Federal evaporative test procedures are used. New testing programs include the events of pre-conditioning, diurnal heat builds and exhaust, running loss, and hot soak tests.

Section 202 of the CAA Amendments of 1990 required EPA to regulate vehicle refueling emissions by requiring onboard emission control systems that would provide a minimum evaporative capture efficiency of 95 percent. In 1994, EPA issued a final rule implementing the control of vehicle refueling emissions through the use of vehicle-based systems. It applies to light-duty vehicles and light-duty trucks. The 1999 MOBILE5b runs include the effects of these standards.

b. Gasoline Volatility

The reduction in emissions attributable to the regulation of gasoline RVP is permanent and enforceable. A June 11, 1990 *Federal Register* notice set standards for fuel volatility by State for the summer ozone season that apply May through September. Phase I of these standards applied in 1989 through 1991. The Phase II standards, which are expressed in psi, apply in 1992 and subsequent years. These standards limit gasoline volatility to 9.0 psi in American Society for Testing and Materials Class C areas (Pennsylvania).

In 1999, the applicable summertime RVP standard, as required by the SIP approved PA gasoline volatility regulation Chapter 126 Subchapter C, for 1998 and subsequent years is 7.8 psi.

c. Automobile Emissions Test and Repair Program

A portion of the reduction in emissions is also attributable to the enhancement of the automobile emissions testing program initiated in October 1997. This program is an annual idle repair inspection program which also includes several anti-tampering visual inspections and a gas cap check.

CHAPTER III
STATE IMPLEMENTATION PLAN APPROVAL

One of the conditions of being redesignated to attainment is that the applicable implementation plan has been fully approved by EPA under Section 110(k) of the CAA. Another is that the State has met all applicable requirements for the area under Section 110 and Part D. This chapter addresses these two criteria.

EPA approved Pennsylvania's 1990 baseline VOC emission inventory on January 14, 1998. A 1990 baseline NOx inventory was submitted to EPA at the same time as the VOC inventory (with final submission of the 15 percent plan).

The stationary air pollution sources in the Pittsburgh-Beaver Valley Area during 1990 to 1999 were subject to the regulations of the Commonwealth of Pennsylvania, Pennsylvania Code in Title 25 Environmental Resources, Chapters 121-143. These regulations include Standards of Performance for New Stationary Sources promulgated by EPA under the Clean Air Act; Standards for Contaminants; National Emission Standards for Hazardous Air Pollutants; Construction, Modification, Reactivation and Operation of Sources; Alternative Emission Reduction Limitations; and Standards for Sources. Pennsylvania has federally approved programs for prevention of significant deterioration (PSD) , new source review and reasonably available control technology.

Pennsylvania adopted and implemented in 1997 an enhanced inspection and maintenance (I/M) program in the area. EPA approved Pennsylvania's I/M program on June 8, 1999.

EPA and the U.S. Department of Transportation (DOT) have issued regulations regarding criteria and procedures for demonstrating and assuring conformity of transportation improvement programs (TIP or program), long range plans (LRP or plan), and individual transportation projects with the requirements of the CAA and the SIP for the specific nonattainment area. Pennsylvania and Southwest Pennsylvania Commission have each complied with the conformity rules found in 40 CFR Part 51, issued November 24, 1993. On November 21, 1994, Pennsylvania submitted a Transportation Conformity SIP amendment to EPA. EPA subsequently revised its rules, requiring states to adopt new SIPs. Pennsylvania submitted such a SIP revision to EPA on August 11, 1998. Subsequently, a series of court actions overturned portions of the rule. EPA will again have to revise its rule. Pennsylvania and affected transportation planning organizations are complying with EPA guidance implementing changes not yet incorporated into regulation.

All transportation conformity analytical and test requirements have been applied in this nonattainment area. The nonattainment area has met all data and analytic requirements of 40 CFR Part 51, including the use of EPA's most recent approved mobile emissions modeling tool and emissions analysis for specified milestone years, incorporation of the most recent planning assumptions into the analysis, and emissions base calculation procedures. All process requirements included in 40 CFR Part 51 have been followed, including, but not limited to, public involvement, consideration and approval by the metropolitan planning organization. 40 CFR Part 51 was first implemented in the nonattainment area in 1994, with an affirmative TIP and LRP conformity finding by DOT in October 1994. The most recent conformity determination was approved by Federal Highway Administration on September 29, 2000.

In consideration of the above, the applicable implementation plan is approvable by EPA under Section 110(k) and meets all applicable requirements for the Pittsburgh-Beaver Valley Area under Section 110 and Part D.

CHAPTER IV
MAINTENANCE PLAN

Section 107(d)(3)(E) of the CAA states that a maintenance plan must be fully approved by EPA before an area can be redesignated as attainment for ozone. The maintenance plan is considered a SIP revision under Section 110 of the CAA and must show that the NAAQS for ozone will be maintained for at least 10 years after redesignation. The plan must also include contingency measures to address any violation of the NAAQS standard.

One of the requirements for ensuring that ozone levels in the Pittsburgh-Beaver Valley Area remain below the standard is to show that future emissions over the 10-year period of analysis will not lead to any exceedances of the standard. Emission estimates for 2007 and 2011 have been developed for this purpose. NO_x, and VOC emission levels will continue to decline from attainment year levels despite growth in population, economic output, and VMT.

The year 2011 was determined to be the appropriate one for preparation of this maintenance plan through consultation with EPA Region III staff. Emission projections have also been developed for 2007 to provide insight into emission levels trends at an interim point during the maintenance period.

A. GROWTH PROJECTIONS: 2007 and 2011

This section describes the data, methods, and assumptions used in developing estimates of emissions growth between 1999 and the two projection years – 2007 and 2011. It first presents the data sources and methods used in developing emissions growth factors for stationary area and non-electricity generating unit (EGU) point sources. Nonroad area source, highway vehicle source and EGU point source growth estimates are described subsequently.

1. Stationary Area and Non-EGU Point Sources

As indicated by Table IV-1, stationary area source emission growth factors were generally derived from EGAS Version 4.0 and regional projections of industrial sector economic output prepared by Standard and Poor's DRI (Pechan, 2001; Smith, 1999). Point sources covered by the EPA NOx SIP Call were grown in accordance with the federal NOx SIP Call.

Table IV-1
Overview of Emission Growth Surrogate Data Used for Stationary Area and Non-EGU Point Sources

Sector	Source Categories	Data Source
Stationary Area	All SCCs except below	EGAS 4.0 SCC-level output for Pittsburgh-Beaver Valley Area
	SCCs with base year emissions derived from per capita emission factors	EGAS 4.0 population forecast for Pittsburgh-Beaver Valley Area (1996-2007 = 6% growth; 1996-2011 = 7.7% growth)
Non-EGU Point	Non-EGU sources	EPA SIP Call growth projections

a. Stationary Area Sources

To develop estimates of emissions growth for stationary area sources, EGAS 4.0 was run in SCC-output mode for Pittsburgh-Beaver Valley Area for 2007 and 2011. The EGAS 4.0 SCC-output option was used because the area source component of the Pittsburgh-Beaver Valley Area inventory does not contain SIC code information that can be used to link with the EGAS 2-digit SIC-output option. The EGAS 2007 and 2011 emission growth factors represent growth from a 1996 base year. These SCC-level growth factors were applied to stationary area SCCs in the 1996 inventory to represent emissions growth excluding the effects of future year controls.

An exception to the use of EGAS SCC-based growth factors was made for the seven solvent utilization area source categories whose base year emission estimates are calculated using per capita emission factors. Population-based growth factors from EGAS 4.0 were linked to these source categories to project 1996-2007 and 1996-2011 emissions growth. The seven solvent utilization area source categories whose base year emissions estimates are based on per capita emissions factors are:

- SCC 2401001000 - Surface Coating, Architectural Coatings;
- SCC 2401005000 - Surface Coating, Auto Refinishing: SIC 7532;
- SCC 2401008000 - Surface Coating, Traffic Markings;
- SCC 2401100000 - Surface Coating, Industrial Maintenance Coatings;
- SCC 2415300000 - Degreasing, All Industries: Cold Cleaning;
- SCC 2415360000 - Degreasing, Auto Repair Services (SIC 75); and
- SCC 2465000000 - Miscellaneous Non-industrial: Consumer, All Products/Processes.

(EGAS 4.0 already uses population data as the emissions growth surrogate indicator for one of these seven categories [SCC 2465000000–Miscellaneous Non-Industrial: Consumer, All Products], but uses constant dollar output data as the surrogate indicator for the remaining six categories.)

Section D describes the post-base year control assumptions that were applied to estimate the final 2007 and 2011 year area source emission estimates.

b. Non-EGU Point Sources

Non-EGU point source growth was projected using the same methods that EPA used in their NO_x SIP Call analysis. EPA used Bureau of Economic Analysis (BEA) growth projections. A detailed discussion of this growth estimate can be found in the October 27, 1998 Federal Register (63 FR 57356).

2. EGU-Point Source Growth Factors

Projected growth in EGU emissions in Pennsylvania was estimated using the same methods that EPA used in their NO_x SIP Call analysis. A detailed discussion of this growth estimate can be found in the October 27, 1998 Federal Register (63 FR 57356). The EPA used the IPM model to estimate EGU growth throughout the eastern United States and correlated that to heat input increases. The IPM results estimated a 15% increase in heat input from 1996 through 2007 for the state of Pennsylvania. This 15 percent increase in expected EGU generation between 1996 and 2007 was converted to an annual growth rate of 1.36 percent to estimate appropriate growth factors for 1999 and 2011. A complete explanation of the IPM model can be found at the EPA website: www.epa.gov/capi/.

3. Highway Vehicles and Nonroad Sources

As with the 1999 highway vehicle emission estimates, MOBILE5b was used to estimate highway vehicle emission factors by vehicle type. The primary difference between the 1999 emission calculation assumptions and those used for the two future years, is the implementation of the federal Tier II Regulation. A summary of the highway vehicle emission modeling assumptions and the methods used for estimating growth in highway vehicle travel are described in detail in Appendix A.

Similar to the 1999 base year emission estimates, projection year emissions for the majority of nonroad mobile sources were developed using EPA Office of Transportation and Air Quality's June 2000 draft NONROAD model. The NONROAD model estimates emissions for diesel, gasoline, liquefied petroleum gasoline, and compressed natural gas-fueled nonroad equipment types. Certain nonroad categories, including commercial marine, aircraft, and locomotives, are not included in the model. Projection year estimates for these categories were developed similar to those used for area sources.

B. ATTAINMENT EMISSIONS INVENTORY

The 1999 base year emissions data that were presented in Table II-2 were used along with the growth and control factors described in this chapter to estimate ozone precursor emissions in 2007 and 2011. The maintenance plan year is 2011. The year 2007 is an intermediate year that has been used for many national and regional ozone modeling studies and serves as a check point for maintenance plan evaluation. A detailed summary of 2007 VOC and NO_x emissions in Pittsburgh-Beaver Valley Area is shown in Table IV-2. The 2011 maintenance plan year summary is shown in Table IV-3. Table IV-4 presents a comparison of VOC and NO_x emissions by major source category for 1999, 2007, and 2011.

C. PERMANENT AND ENFORCEABLE CONTROL MEASURES

This section describes the permanent and enforceable adopted control measures that take effect subsequent to 1999 that contribute to reductions in future year emissions.

1. Stationary Area Source Control Measures - VOC

a. Vehicle Refueling

Evaporative hydrocarbon emissions associated with the transfer of fuel from underground storage tanks to motor vehicles are known as refueling emissions. Vehicle refueling emissions are controlled through the national onboard vapor recovery rule promulgated in January of 1994. This rule applies to all light-duty gasoline vehicles (LDGVs) and light-duty gasoline trucks (LDGTs) with a phase-in period beginning with the 1998 model year and differing by vehicle type. MOBILE5b includes the effects of this rule in its VOC emission factors for gasoline powered vehicles. In addition, Pennsylvania has implemented a Stage II vehicle refueling program in the area. This program was fully implemented in December 2000. The program affects approximately 90 percent of the gasoline sold in the area.

b. Automobile Refinish Coatings

The national VOC emission standards for automobile refinish coatings apply to automobile refinish coatings and coating components manufactured on or after January 11, 1999 for sale and distribution in the United States (63 FR 48806, 1998). In addition, Pennsylvania has adopted mobile equipment repair and refinishing regulations that specify improved coating application equipment, spray gun cleaning practices, and worker training. It is estimated that these measures will result in an additional 38 percent reduction of VOC from these operations.

TABLE IV-2: Summary of 2007 Emissions (ozone season tons/day)

	Point Source		Area Source		Total	
	VOC	NO_x	VOC	NO_x	VOC	NO_x
						0.00
Coal	1.29	91.43	0.00	0.00	1.29	91.43
Oil	5.65	2.26	0.00	0.00	5.65	2.26
Gas	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Internal Combustion	0.10	3.70	0.00	0.00	0.10	3.70
						0.00
Coal	0.05	4.33	0.00	0.00	0.05	4.33
Oil	0.02	1.22	0.00	0.00	0.02	1.22
Gas	1.73	17.82	0.00	0.00	1.73	17.82
Other	0.01	0.00	0.00	0.00	0.01	0.00
Internal Combustion	0.85	18.70	0.00	0.00	0.85	18.70
						0.00
Commercial/Institutional Coal	0.11	1.32	0.00	0.00	0.11	1.32
Commercial/Institutional Oil	0.03	0.59	0.00	0.85	0.03	1.44
Commercial/Institutional Gas	1.03	9.90	0.00	2.08	1.03	11.98
Misc. Fuel Comb. (Except Residential)	0.05	0.03	0.00	0.00	0.05	0.03
Residential Other	0.00	0.00	0.17	4.13	0.17	4.13
						0.00
Organic Chemicals	0.16	0.00	0.00	0.00	0.16	0.00
Inorganic Chemicals	0.00	0.00	0.00	0.00	0.00	0.00
Polymers & Resins	4.92	0.02	0.00	0.00	4.92	0.02
Agricultural Chemicals	0.00	1.12	0.00	0.00	0.00	1.12
Paints, Varnishes, Lacquers, Enamels	1.56	0.01	0.00	0.00	1.56	0.01
Pharmaceuticals	0.00	0.00	0.00	0.00	0.00	0.00
Other Chemicals	1.58	0.00	0.00	0.00	1.58	0.00
						0.00
Non-Ferrous Metals Processing	0.24	0.61	0.00	0.00	0.24	0.61
Ferrous Metals Processing	5.56	31.51	0.00	0.00	5.56	31.51
Metals Processing NEC	0.32	0.06	0.00	0.00	0.32	0.06
						0.00
Oil & Gas Production	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refineries & Related Industries	0.01	0.00	0.00	0.00	0.01	0.00
Asphalt Manufacturing	0.01	0.02	0.00	0.00	0.01	0.02
						0.00
Agriculture, Food, & Kindred Products	0.28	0.00	1.16	0.00	1.44	0.00
Textiles, Leather, & Apparel Products	0.00	0.00	0.00	0.00	0.00	0.00
Wood, Pulp & Paper, & Publishing Products	0.00	0.00	0.00	0.00	0.00	0.00
Rubber & Miscellaneous Plastic Products	0.11	0.00	0.00	0.00	0.11	0.00
Mineral Products	0.38	13.54	0.00	0.00	0.38	13.54
Machinery Products	0.08	0.01	0.00	0.00	0.08	0.01
Electronic Equipment	0.04	0.00	0.00	0.00	0.04	0.00
Miscellaneous Industrial Processes	0.20	0.03	0.00	0.00	0.20	0.03

						0.00
Degreasing	1.51	0.00	23.02	0.00	24.53	**0.00**
Graphic Arts	0.15	0.01	8.13	0.00	8.28	**0.01**
Dry Cleaning	0.26	0.00	0.59	0.00	0.85	**0.00**
Surface Coating	2.62	0.02	50.14	0.00	52.76	**0.02**
Other Industrial	1.42	0.00	0.00	0.00	1.42	**0.00**
Nonindustrial	0.00	0.00	30.41	0.00	30.41	**0.00**
						0.00
Bulk Terminals & Plants	0.79	0.00	0.00	0.00	0.79	**0.00**
Petroleum & Petroleum Product Storage	1.43	0.00	0.00	0.00	1.43	**0.00**
Petroleum & Petroleum Product Transport	0.50	0.01	0.17	0.00	0.67	**0.01**
Service Stations: Stage I	0.00	0.00	0.44	0.00	0.44	**0.00**
Service Stations: Stage II	0.00	0.00	2.82	0.00	2.82	**0.00**
Service Stations: Breathing & Emptying	0.00	0.00	1.50	0.00	1.50	**0.00**
Organic Chemical Storage	0.80	0.00	0.00	0.00	0.80	**0.00**
Organic Chemical Transport	0.08	0.00	0.00	0.00	0.08	**0.00**
Inorganic Chemical Storage	0.00	0.00	0.00	0.00	0.00	**0.00**
Bulk Materials Storage	0.01	0.19	0.00	0.00	0.01	**0.19**
						0.00
Incineration	0.00	0.00	4.13	1.56	4.13	**1.56**
Open Burning	0.00	0.00	5.62	1.12	5.62	**1.12**
POTW	0.06	0.00	6.05	0.00	6.11	**0.00**
Industrial Waste Water	0.14	0.00	0.00	0.00	0.14	**0.00**
TSDF	0.00	0.00	0.29	0.00	0.29	**0.00**
Landfills	0.20	0.28	1.21	0.00	1.41	**0.28**
Other	0.00	0.00	0.00	0.00	0.00	**0.00**
						0.00
Light-Duty Gas Vehicles & Motorcycles	0.00	0.00	55.34	50.59	55.34	**50.59**
Light-Duty Gas Trucks	0.00	0.00	31.40	32.12	31.40	**32.12**
Heavy-Duty Gas Vehicles	0.00	0.00	4.92	9.90	4.92	**9.90**
Diesels	0.00	0.00	6.56	36.51	6.56	**36.51**
						0.00
Non-Road Gasoline	0.00	0.00	36.73	4.48	36.73	**4.48**
Non-Road Diesel	0.00	0.00	5.68	54.17	5.68	**54.17**
Miscellaneous	0.00	0.00	0.01	8.44	0.01	**8.44**
						0.00
Other Combustion	0.00	0.00	0.05	0.01	0.05	**0.01**
Health Services	0.00	0.00	0.00	0.00	0.00	**0.00**
Cooling Towers	0.00	0.00	0.00	0.00	0.00	**0.00**
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	**0.00**
Totals	**36.34**	**198.73**	**276.54**	**205.95**	**312.88**	**404.68**

TABLE IV-3: Summary of 2011 Emissions (ozone season tons/day)

Source Category	Point Source VOC	Point Source NO_x	Area Source VOC	Area Source NO_x	Total VOC	Total NO_x
Fuel Comb. Elec. Utility						
Coal	1.36	91.43	0.00	0.00	1.36	91.43
Oil	5.96	2.26	0.00	0.00	5.96	2.26
Gas	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00
Internal Combustion	0.11	3.70	0.00	0.00	0.11	3.70
Fuel Comb. Industrial						
Coal	0.05	4.35	0.00	0.00	0.05	4.35
Oil	0.02	1.26	0.00	0.00	0.02	1.26
Gas	1.79	17.36	0.00	0.00	1.79	17.36
Other	0.01	0.00	0.00	0.00	0.01	0.00
Internal Combustion	0.89	19.60	0.00	0.00	0.89	19.60
Fuel Comb. Other						
Commercial/Institutional Coal	0.12	1.40	0.00	0.00	0.12	1.40
Commercial/Institutional Oil	0.03	0.59	0.00	0.82	0.03	1.41
Commercial/Institutional Gas	1.07	10.38	0.00	2.11	1.07	12.49
Misc. Fuel Comb. (Except Residential)	0.05	0.04	0.00	0.00	0.05	0.04
Residential Other	0.00	0.00	0.17	4.05	0.17	4.05
Chemical & Allied Product Mfg						
Organic Chemicals	0.16	0.00	0.00	0.00	0.16	0.00
Inorganic Chemicals	0.00	0.00	0.00	0.00	0.00	0.00
Polymers & Resins	5.19	0.02	0.00	0.00	5.19	0.02
Agricultural Chemicals	0.00	1.18	0.00	0.00	0.00	1.18
Paints, Varnishes, Lacquers, Enamels	1.65	0.01	0.00	0.00	1.65	0.01
Pharmaceuticals	0.00	0.00	0.00	0.00	0.00	0.00
Other Chemicals	1.67	0.00	0.00	0.00	1.67	0.00
Metals Processing						
Non-Ferrous Metals Processing	0.23	0.59	0.00	0.00	0.23	0.59
Ferrous Metals Processing	5.34	30.25	0.00	0.00	5.34	30.25
Metals Processing NEC	0.30	0.06	0.00	0.00	0.30	0.06
Petroleum & Related Industries						
Oil & Gas Production	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refineries & Related Industries	0.01	0.00	0.00	0.00	0.01	0.00
Asphalt Manufacturing	0.01	0.02	0.00	0.00	0.01	0.02
Other Industrial Processes						
Agriculture, Food, & Kindred Products	0.29	0.00	1.24	0.00	1.53	0.00
Textiles, Leather, & Apparel Products	0.00	0.00	0.00	0.00	0.00	0.00
Wood, Pulp & Paper, & Publishing Products	0.00	0.00	0.00	0.00	0.00	0.00
Rubber & Miscellaneous Plastic Products	0.12	0.00	0.00	0.00	0.12	0.00
Mineral Products	0.39	13.75	0.00	0.00	0.39	13.75
Machinery Products	0.09	0.01	0.00	0.00	0.09	0.01
Electronic Equipment	0.04	0.00	0.00	0.00	0.04	0.00
Miscellaneous Industrial Processes	0.21	0.03	0.00	0.00	0.21	0.03

Solvent Utilization						
Degreasing	1.60	0.00	24.37	0.00	25.97	0.00
Graphic Arts	0.15	0.01	8.68	0.00	8.83	0.01
Dry Cleaning	0.27	0.00	0.63	0.00	0.90	0.00
Surface Coating	2.66	0.02	54.01	0.00	56.67	0.02
Other Industrial	1.51	0.00	0.00	0.00	1.51	0.00
Nonindustrial	0.00	0.00	30.70	0.00	30.70	0.00
Storage & Transport						
Bulk Terminals & Plants	0.83	0.00	0.00	0.00	0.83	0.00
Petroleum & Petroleum Product Storage	1.46	0.00	0.00	0.00	1.46	0.00
Petroleum & Petroleum Product Transport	0.53	0.01	0.17	0.00	0.70	0.01
Service Stations: Stage I	0.00	0.00	0.45	0.00	0.45	0.00
Service Stations: Stage II	0.00	0.00	2.02	0.00	2.02	0.00
Service Stations: Breathing & Emptying	0.00	0.00	1.53	0.00	1.53	0.00
Organic Chemical Storage	0.84	0.00	0.00	0.00	0.84	0.00
Organic Chemical Transport	0.08	0.00	0.00	0.00	0.08	0.00
Inorganic Chemical Storage	0.00	0.00	0.00	0.00	0.00	0.00
Bulk Materials Storage	0.01	0.19	0.00	0.00	0.01	0.19
Waste Disposal & Recycling						
Incineration	0.00	0.00	4.50	1.70	4.50	1.70
Open Burning	0.00	0.00	5.74	1.15	5.74	1.15
POTW	0.06	0.00	6.59	0.00	6.65	0.00
Industrial Waste Water	0.15	0.00	0.00	0.00	0.15	0.00
TSDF	0.00	0.00	0.31	0.00	0.31	0.00
Landfills	0.21	0.30	1.32	0.00	1.53	0.30
Other	0.00	0.00	0.00	0.00	0.00	0.00
Highway Vehicles						
Light-Duty Gas Vehicles & Motorcycles	0.00	0.00	57.31	45.34	57.31	45.34
Light-Duty Gas Trucks	0.00	0.00	32.49	28.60	32.49	28.60
Heavy-Duty Gas Vehicles	0.00	0.00	4.88	10.22	4.88	10.22
Diesels	0.00	0.00	7.31	30.86	7.31	30.86
Off-Highway						
Non-Road Gasoline	0.00	0.00	32.49	4.34	32.49	4.34
Non-Road Diesel	0.00	0.00	4.49	46.77	4.49	46.77
Miscellaneous	0.00	0.00	0.01	9.34	0.01	9.34
Miscellaneous						
Other Combustion	0.00	0.00	0.05	0.01	0.05	0.01
Health Services	0.00	0.00	0.00	0.00	0.00	0.00
Cooling Towers	0.00	0.00	0.00	0.00	0.00	0.00
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00
Totals	**37.52**	**198.82**	**281.46**	**185.31**	**318.98**	**384.12**

Table IV-4
VOC and NO_x Emissions Summary: 1999, 2007, and 2011

	VOC Emissions (tons per day)		
Major Source Category	**1999**	**2007**	**2011**
Point Sources	34	36	38
Stationary Area Sources	130	136	142
Highway Vehicles	110	98	102
Nonroad Engines/Vehicles	64	42	37
Total	**338**	**313**	**319**

	NO_x Emissions (tons per day)		
Major Source Category	**1999**	**2007**	**2011**
Point Sources	282	199	199
Stationary Area Sources	10	10	10
Highway Vehicles	171	129	115
Nonroad Engines/Vehicles	75	67	60
Total	**538**	**405**	**384**

c. Architectural and Industrial Maintenance (AIM) Coatings

In 1998, EPA promulgated a national rule for reducing VOC emissions from specific types of AIM coatings (63 FR 48848, 1998). AIM coatings are used by contractors, industry, and households, and include: interior and exterior paints, industrial maintenance coatings, wood finishes, cement coatings, roof coatings, traffic marking paints, and specialty coatings. Provisions of national VOC emission standards for AIM coatings apply to each coating manufactured on or after September 13, 1999 for sale or distribution in the United States. For any coating registered under the Federal Insecticide, Fungicide, and Rodenticide Act, the provisions of this subpart apply to any such coating manufactured on or after March 13, 2000 for sale or distribution in the United States.

The national rule is assumed to be fully effective in 2007 and 2011. The EPA estimated a 20.2 percent reduction in baseline emissions from this rule after accounting for losses in emission reductions due to the rule's exceedance fee and tonnage exemption (Herring, 1999). For this analysis, a 20 percent reduction was applied to the above three source categories in both 2007 and 2011.

d. Wood Furniture Coating

In December 1995, EPA promulgated a Title III standard to control hazardous air pollutant (HAP) emissions from wood furniture coating (60 FR 62930, 1995). The four basic wood furniture manufacturing operations that are included in the affected emission source are: finishing, gluing, cleaning, and wash-off operations. In May 1996, EPA issued the final Control Techniques Guideline (CTG) document for control of VOC emissions from wood furniture manufacturing operations. Pennsylvania adopted regulations in June, 2000 that implement the provisions of the CTG. EPA estimated that the application of presumptive RACT by facilities in ozone nonattainment areas and the ozone transport region would lead to a 31 percent reduction from current levels in VOC emissions from the wood furniture industry (EPA, 1996). In this analysis, a 30 percent VOC control efficiency was applied.

e. Metal Furniture Coating

Under Title III of the CAA, by November 2000, EPA is scheduled to regulate HAP emissions (including VOC) from metal product coating operations. HAPs are to be regulated initially based on maximum achievable control technology (MACT). A 30 percent VOC reduction is assumed in 2007 for the future MACT standard for this category which is consistent with EPA estimates.

f. Aircraft Surface Coating

EPA promulgated the Aerospace Manufacturing National Emission Standard for Hazardous Air Pollutants (NESHAP) on September 1, 1995 (60 FR 45948, 1995). The final rule affects over 2,800 major source facilities that produce or repair aerospace vehicles or vehicle parts, such as airplanes, helicopters, and missiles (EPA, 1995). In addition, in April, 1999 Pennsylvania adopted regulations implementing the VOC control provisions for aerospace coating operations defined in EPA's CTG for the industry. The rule was estimated to lead to a reduction in HAP emissions, many of which are also VOCs, by 60 percent, by 1998. A 60 percent VOC reduction is applied in this analysis.

g. Marine Surface Coating

In December 1995, EPA issued a NESHAP for shipbuilding and ship repair based on the maximum HAP limits for 23 types of marine coatings. To comply with the NESHAP, affected facilities may not apply any marine coating with a HAP content in excess of the applicable limit, and are required to implement the work practices specified in the rule. Most, if not all, existing *major source* shipyards are located in ozone nonattainment areas, and will have to control VOC emissions under Title I in addition to Title III (EPA, 1994). EPA developed the CTG for this source category in parallel with the NESHAP because of the overlap involving coating limits. The controls required for complying with the NESHAP also apply to VOCs, and constitute draft recommended best available control measures. A 24 percent VOC reduction is applied in this analysis (Serageldin, 1994) which is consistent with EPA estimates.

h. Municipal Solid Waste Landfills

The regulation of municipal solid waste landfills under the authority of the CAA will occur under both Title I and Title III. Title I regulations for this source category were proposed in May 1991, and promulgated in March 1996 (61 FR 9905, 1996). The national rule represents a New Source Performance Standard regulation for new municipal solid waste landfills under Section 111(b) of the CAA, and an emission guideline for existing landfills under Section 111(d). The rule regulates emissions of methane and nonmethane organic compounds, including VOC, HAPs, and odorous compounds. Required controls include a gas collection system, and a control device capable of reducing nonmethane organic compounds in the collected gas by 98 weight-percent. The national emission reduction expected from the emission guideline is 53 percent. In this analysis, a VOC control efficiency of 98 percent and rule penetration of 54 percent have been assumed. The rule penetration value reflects the fraction of landfill emissions that are affected by this rule.

2. Point Source Control Measures

The Commonwealth adopted 25 PA Code Chapter 145. This regulation establishes a cap on NO_x emissions from large sources beginning in the ozone season of 2003. The regulation applies to large EGUs rated at greater than 25 megawatts and large non-EGUs rated at greater than 250 mmBtu/hr. These sources are provided a fixed number of NO_x allowances for each ozone season. A NO_x allowance is the authorization to emit one ton of NO_x. The regulation allows affected sources to trade or sell allowances in order to achieve cost effective controls. The Chapter 145 regulation was modeled after the EPA Section 126 model rule published on January 18, 2000 in the Federal Register (65 FR 2674). The EPA analysis of the modeling program indicated that trading would not have a significant impact on local nonattainment areas. While the Department agrees with this conclusion, the Department will review the impact of trading on the Pittsburgh/Beaver Valley Area caused by trading NO_x allowances. Because the EGU budget is to be implemented via a trading program, in practice, 0.15 pounds NO_x per million British thermal units will be the average emission rate. Individual units will emit at higher, or lower, emission rates than this. Pennsylvania's attainment plan assumes that emission reductions will be achieved by all states subject to the NOx SIP Call. These reductions are necessary for Pittsburgh-Beaver Valley Area to achieve and maintain the one-hour ozone standard.

3. Highway Vehicle and Nonroad Measures

There are a number of permanent and enforceable measures that are expected to further reduce highway vehicle emission rates, so that they are lower in 2007 and 2011 than they are in 1999. The measures discussed below are in addition to those already listed in Chapter II, i.e., those that affected emissions in 1999.

Highway vehicle emissions in the OTC states will be reduced during the maintenance plan period by the NLEV Program. On March 9, 1998, EPA found the NLEV program to be in effect. Nine northeastern States and 23 manufacturers opted in to this program, and the opt-ins met the criteria set forth by EPA in its NLEV regulations. As a result, starting in model year 1999 in Pennsylvania – and other OTC States – new cars and light trucks meet NLEV emission standards.

EPA determined that additional reductions in NO_x and VOC emissions are needed from heavy-duty vehicles, and promulgated a new national emission standard, which is referred to as the HDDV 2.0 grams per brake horsepower-hour NO_x standard. This standard reduces HDDV emissions beginning with the 2004 model year

In 2000, EPA also established Tier 2 motor vehicle emission standards and gasoline sulfur control requirements. This set of emission standards reduces emissions from new passenger cars and light trucks, including pickup trucks, vans, minivans, and sport utility vehicles. The program is a comprehensive regulatory initiative that treats vehicles and fuels as a system, combining requirements for much cleaner vehicles with requirements for much lower levels of sulfur in gasoline.

This plan does not include emission reductions expected after 2007 from even more stringent standards for heavy-duty diesel powered trucks as well as highway diesel fuel sulfur control requirements. This rule was finalized by EPA in December 2000 and reaffirmed by the EPA Administrator on February 20, 2001.

While nonroad equipment populations increase between 1999 and 2007, and increase again between 2007 and 2011, nonroad VOC and NO_x emissions are declining over this same period, due primarily to implementation of the following Federal permanent and enforceable measures:

- Tier 1, Tier 2, and Tier 3 compression-ignition standards for diesel engines greater than 50 horsepower;
- Tier 1 and Tier 2 compression-ignition standards for diesel engines below 50 horsepower;
- Phase 1 and Phase 2 of the spark-ignition standards for gasoline engines less than 25 horsepower; and
- Recreational spark-ignition marine engine controls.

D. MOTOR VEHICLE EMISSION BUDGETS FOR TRANSPORTATION CONFORMITY

Pennsylvania proposes to establish new ceilings for highway emissions in order to ensure that transportation emissions do not impede clean air goals in the next decade. The Clean Air Act Amendments (Section 176c) provides a mechanism by which federal funded or approved highway and transit plans, programs and projects are determined not to produce new air quality violations, worsen existing violations or delay timely attainment of national air quality standards. EPA regulations issued to implement transportation conformity provides that motor vehicle emission "budgets" establish caps of these emissions which cannot be exceeded by the predicted transportation system emissions in the future. Transportation agencies in Pennsylvania are responsible for making timely transportation conformity determinations. The Southwest Pennsylvania Commission holds that responsibility for the Pittsburgh-Beaver Valley area.

The following, once they are determined to be adequate for purposes of conformity by EPA, will establish transportation conformity budgets for the seven-county Pittsburgh area. DEP will revise these budgets with EPA's new modeling tool, MOBILE6, at an appropriate time.

Table IV-5: Motor Vehicle Emission Budgets

POLLUTANT	VOCs	NOx
1999	99,472 kg/day 109.65 tons/day	155,176 kg/day 171.05 tons/day
2007	89,102 kg/day 98.22 tons/day	117,136 kg/day 129.12 tons/day
2011	92,533 kg/day 102 tons/day	104,343 kg/day 115.02 tons/day

E. CONTINGENCY MEASURES

The Commonwealth of Pennsylvania will track the attainment status of the ozone NAAQS in the Pittsburgh-Beaver Valley Area by reviewing air quality and emissions data during the maintenance period. The Commonwealth will develop periodic emission inventories (every 3 years) beginning in 2002, and will evaluate these periodic inventories to see if they exceed the baseline (1999) maintenance inventory by more than 10 percent. If a 10 percent exceedance occurs, the Commonwealth will evaluate whether any further emission control measures should be implemented.

Contingency measures would also be considered if an ozone NAAQS exceedance occurs. If an exceedance occurs, the Commonwealth will evaluate whether additional emission control measures should be implemented. The Commonwealth of Pennsylvania contingency plan will be triggered in the event of a monitored violation of the ozone standard. A violation means recording four exceedances of the ozone NAAQS within a consecutive 3-year period at a specific monitoring site. If a violation occurs, the Commonwealth will adopt additional emission reductions, as expeditiously as practicable, in accordance with the Pennsylvania Air Pollution Control Act to return the area to attainment with the health-based one-hour standard. The Commonwealth will also continue to operate the air monitoring network in accordance with 40 CFR 58, with no reductions in the number of sites from those in the existing network unless pre-approved by EPA.

Contingency plan measures include the four VOC model rules currently being considered as additional attainment measures for the Philadelphia Ozone Nonattainment Area. The VOC model rules have the potential to reduce emissions from consumer products, portable fuel containers, AIM coatings and solvent cleaning operations.

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APPENDIX A

Highway Vehicle Emissions Inventories and Forecasts for the Pittsburgh 7-County Nonattainment Area

An Explanation of Methodology

Prepared for:

Mobile Sources Section, Bureau of Air Quality
Pennsylvania Department of Environmental Protection
RCSOB, 400 Market Street, 12th Floor
Harrisburg, PA 17105-8468

Air Quality Section
Pennsylvania Department of Transportation
6th floor Forum Place, 555 Walnut Street
Harrisburg, PA 17101-1900

Prepared by:

Michael Baker, Jr., Inc.
801 Cromwell Park Dr., Suite 110
Glen Burnie, MD 21061

Urbitran/Garmen
150 River Road, Building E
Montville, NJ 07045

March 2001

Highway VehicleEmissions Inventories and Forecasts for
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An Explanation of Methodology
March 2001

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PITTSBURGH 7-COUNTY NON-ATTAINMENT AREA EMISSIONS INVENTORIES

The 1990 Inventory

The 1990 baseline inventory presented in this SIP is the one submitted in Pennsylvania's previous SIP. Highway vehicle emissions estimates for 1999 and beyond use newer techniques such as a more current MOBILE model, more accurate truck emission rates provided by EPA and improved handling of truck VMT estimates. These improved techniques would have increased our emission estimates for 1990.

DEP has therefore also prepared a revised estimate of the 1990 highway emissions using these improvement techniques so that the public can compare emissions estimated with similar techniques.

Changes To Modeling Methodology and Input Parameters for 1999, 2007 and 2011

The emissions inventory for the Pittsburgh 7-County Non-attainment Area reflects the highway mobile source emission projections. Emissions for 1999, 2007 and 2011 were calculated using EPA's MOBILE model version 5B with Pennsylvania's latest planning assumptions and data sources that include 1999 traffic counts from PennDOT's Roadway Management System (RMS) and Highway Performance Management System (HPMS).

For these years, three additional federal control strategies have been added to the planning assumptions for the Pittsburgh area. They include the new 2004 NOx standard for heavy-duty diesel engines (HDE), the national low emission vehicle (NLEV) standard for light-duty gasoline fueled vehicles, and the Tier 2 program which provides new federal emission standards on all vehicles designed for passenger use in the future. Other planning assumptions and methodologies remain consistent with previous SIP submittals for the Pittsburgh 7-county ozone non-attainment area.

The new HDE NOx standard was promulgated in October 1997 and combined emission standards of NOx and non-methane hydrocarbons (NMHC) from model year 2004 and later heavy-duty diesel engines used in trucks and buses. Manufacturers of such engines have the choice of certifying their new engines to either a 2.4 g/bhp-hr NMHC plus NOx standard, or to a 2.5 g/bhp-hr NMHC plus NOx standard with a limit of 0.5 g/bhp-hr on NMHC.

The NLEV program started in the northeast with 1999 model year light-duty cars and trucks (up to 6,000 pounds gross vehicle weight) and nationally with 2001 model year vehicles. The program ensures that most new vehicles sold meet emission standards significantly more stringent than Tier 1 vehicles. It will be superceded by the Tier 2 program beginning with 2004 model year vehicles. The NLEV program was developed as a consensus among Ozone Transport Region states and the automobile manufacturers and is now enforced by EPA as a federal program. NLEV benefits were calculated using EPA's MOBILE5 Information Sheet #6.

The Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements (Tier 2 standards) for passenger cars, light trucks, and larger passenger vehicles will phase in more stringent emission standards starting with the 2004 model year. It affects larger vehicles than the NLEV program.

Lower sulfur fuel to be available in 2004 ensures the effectiveness of low emission control technologies. The program is designed to focus on reducing the emissions most responsible for the ozone and particulate matter (PM) impact from these vehicles. Tier 2 benefits were calculated using EPA's MOBILE5 Information Sheet #8.

The key elements to the modeling protocol for 1999, 2007 and 2011 are outlined below:

Network Data Input

The inventory analysis runs utilize an input data source incorporating recently acquired 1999 Roadway Management System (RMS) data for each county. The RMS database contains physical characteristics and traffic volumes for state route segments throughout the state. Traffic volumes are adjusted to a July weekday using the most recent (1999) seasonal adjustment factors developed by PennDOT's Bureau of Planning and Research. The traffic volume data is used to compile VMT by county, area group, and functional class which is then adjusted to match the reported HPMS VMT totals for 1999.

Future year volumes for individual RMS roadway segments are developed from factors prepared by the Bureau of Planning and Research in an annual traffic factor report. Factors from 1995-1999 are utilized to extrapolate future growth in the Pittsburgh region.

PPAQ (Post-Processor for Air Quality)

The PPAQ software system continues to be used for speed calculations, preparation of MOBILE input files, and processing of MOBILE output files. The software has gone through several updates to refine the software and increase its capability and flexibility.

US EPA's MOBILE Model

The modeling was performed using EPA's approved MOBILE model, version MOBILE5B.

I/M Credit Data Files

EPA periodically updates their I/M credit files as new cutpoints are established. The new files can be easily downloaded from the EPA OMS or TNN websites. EPA's latest I/M credit data file for Tech IV+ vehicles (1981+ model years) is the IMDATA4.D. The I/M credit file for Tech I and II vehicles (pre-1981 model years) is TECH12.D

Pittsburgh 7-County Area – PA97 I/M Program for 4 counties

The PA97 I/M program is included for Allegheny, Beaver, Washington, and Westmoreland counties. The remaining three counties do not assume an I/M program. The PA97 I/M program includes:

- 2-speed idle test (1981 MY and newer)
- idle test (1975 – 1980 MY)
- anti-tampering (1975 and newer MY)
- gas cap pressure check (1975 and newer)

Vehicle Age Distributions

Vehicle age distributions are input to MOBILE for each county based on registered vehicles that reflect July 1 summer conditions. These distributions reflect the percentage of vehicles in the fleet up to 25 years old and are listed by the eight EPA vehicle types. The updated vehicle age distributions have been acquired for this inventory submission from PennDOT Bureau of Motor Vehicles Registration Database. The modeling utilizes vehicle age distributions from July 1999.

Vehicle Type Distributions:

Distributions have been created to divide the VMT to each of the eight MOBILE vehicle types needed for emission calculations. The vehicle type distributions were developed using a similar methodology as used in previous SIP submissions but with updated input data. The distributions were developed from the combination of MOBILE5B defaults for 1999, 1999 RMS truck percentages, and 1999 PennDOT hourly traffic data.

Summaries of significant parameters are shown in Table 1.

TABLE 1: MOBILE MODELING PARAMETERS

Analysis Year	1990 Inventory	1990 Recalculation	1999	2007
Mobile Model	MOBILE5a	MOBILE5B	MOBILE5B	MOBILE5B
PPAQ Version	PPAQ1 Ver 2.5	PPAQ1 Ver 4.0	PPAQ1 Ver 4.0	PPAQ1 Ver 4.0
Input Network Data	1990 RMS	1990 RMS	1999 RMS	1999 RMS
Speed Calculation Method	PPAQ by Hour	PPAQ by Hour	PPAQ by Hour	PPAQ by Hour
HPMS Adjustments	Adjusted to 1990 HPMS	Adjusted to 1990 HPMS	Adjusted to 1999 HPMS	Adjusted to 1999 HPMS
Seasonal Adjustments	July Weekday	July Weekday	July Weekday	July Weekday
Time Periods	4 (AM, Midday, PM & Night)	4 (AM, Midday, PM & Night)	4 (AM, Midday, PM & Night)	4 (AM, Midday, PM & Night)
VMT Growth	Actual 1990 HPMS	Actual 1990 HPMS	Actual 1999 HPMS	PennDOT Growth Factors to '07
Vehicle Age Distribution	1993	1993	1999	1999
HDDV Age Distribution	1990 Defaults	1990 Defaults	MOBILE6 Defaults (1996)	MOBILE6 Defaults (1996)
Vehicle Fleet (VMT Mix) Distribution	1990 PennDOT Traffic Info / MOBILE4 Defaults	1990 PennDOT Traffic Info / MOBILE5b Defaults	1999 PennDOT Traffic Info / MOBILE5b	1999 PennDOT Traffic Info / MOBILE5b
Temperatures	1993 SIP Temps	1993 SIP Temps	1993 SIP Temps	1993 SIP Temps
I/M Program	Basic I/M (Alle, urban zip codes in Beav, Wash, West)	Basic I/M (Alle, urban zip codes in Beav, Wash, West)	PA97 (Alleg, Beaver, Wash, Westmld)	PA97 Alleg, Beaver, Wash, Westmld)
I/M Cutpoints	Default	Default	Default	Default
ATP	None	None	7 inspections	7 inspections
Gas Cap	None	None	Yes (All MY)	Yes (All MY)
RVP / RFG	8.4	8.4	7.8 / No	7.8 / No
NLEV	No	No	Yes	Yes
NLEV Flags	N/A	N/A	99 1 1	99 1 1
2004 HDE Standard	N/A	Updated 1990 HDDV BERs	Yes	Yes
Tier II*	No	No	Yes	Yes

* Emission benefits calculated with off-model spreadsheet

INTRODUCTION

The purpose of this document is to explain how Pennsylvania estimates emissions from highway vehicles for inclusion in its emission inventories and State Implementation Plans.

Overview of Emissions Inventories

Under the Clean Air Act Amendments of 1990, Pennsylvania is required to develop emission inventories for ozone precursors -- volatile organic compounds (VOC) and nitrogen oxides (NOx). A baseline 1990 inventory was required statewide. Two ozone nonattainment areas in Pennsylvania have also been required to achieve US EPA specified minimum percentage reductions in VOC: the seven-county Pittsburgh area and the five-county Philadelphia area. For these areas, projected inventories, both with and without anticipated control strategies, have been prepared for several "milestone" years. Finally, states must develop periodic inventories to "refresh" the 1990 inventory, using updated data and/or estimation methods.

Pennsylvania's inventories generally categorize emissions into four categories:

- highway vehicles
- stationary sources (major industrial, commercial and utility sources)
- area sources (smaller industrial/commercial sources, consumer products)
- nonroad mobile sources (including construction and agricultural equipment, lawn and garden equipment)

Of all of the sources of air pollution, only the emissions of some stationary sources are measured directly and continuously through instrumentation. Emissions from all other sources must be estimated in some fashion, including those from highway vehicles. In their very simplest form, estimates of emissions follow the following pattern:

Emission rate x activity level = emissions per time period (usually day or year)

Most emission rates have been developed by EPA, in cooperation with industry and states, over many years and are compiled and documented in a reference volume, Compilation of Air Pollution Emission Factors (AP-42).

For example, the annual VOC emissions from residential fuel oil heating could be estimated by:

AP-42 emission rate	*x*	*activity level* =	*emissions*
0.713 pounds/gallon	*x*	# dwelling units *x* % using oil *x* # gallons per unit	# pounds of VOC per year

Adding up the products of the emission rates and activity levels for all sources of a given pollutant constitutes the emission inventory for that pollutant.

Highway Vehicle Emission Inventories

Highway vehicles contribute significantly to air pollution, particularly to ground-level ozone, which is the most persistent air pollutant in Pennsylvania. Ozone is not created directly but formed in sunlight from VOCs and NOx. Both VOCs and NOx are emitted from highway vehicles. Pennsylvania's ozone-related emission inventory efforts have been focused on these pollutants.

Obviously, direct measurement of emission levels from all vehicles in use is impossible. In comparison to highway vehicles, estimating residential heating emissions is a fairly simple calculation because there is a constant emission rate and a fairly simple measure of activity. For highway vehicles, however, estimating the emission rate and activity levels of all vehicles on the road during a typical summer day is a complicated endeavor.

If every vehicle emitted the same amount of pollution all the time, one could simply multiply those emission standards (emission rate in grams of pollution per mile) times the number of miles driven (activity level) to estimate total emissions. But, the fact is that emission rates from all vehicles vary over the entire range of conditions under which they operate. These variables include air temperature, speed, traffic conditions, operating mode (started cold? started warm? running already warmed up?) and fuel. The inventory must also account for non-exhaust or evaporative emissions. In addition, the fleet is composed of several generations, types of vehicles and their emission control technologies, each of which performs differently. This requires that the composition of the fleet (vehicle ages and types) must also be included in the estimation algorithm.

In order to estimate both the rate at which emissions are being generated and to calculate vehicle miles traveled (activity level), Pennsylvania examines its road network and fleet to estimate vehicles activity. For ozone-related inventories, this is done for a typical summer (July) weekday. Not only must this be done for a baseline year, but it must also be projected into the future. This process involves a large quantity of data and is extremely complex.

Computer models have been developed to perform these calculations by simulating the travel of vehicles on the Commonwealth's roadway system. These models then generate emission rates (also called emission factors) for different vehicle types for area-specific conditions and then combine them in summary form. The "area-specific conditions" include vehicle and highway data, plus control measure characteristics and future year projections of all variables.

MOBILE. The heart of the highway vehicle emission calculation procedure is EPA's highway vehicle emission factor model, MOBILE. This is a FORTRAN program that calculates **average** in-use fleet emission factors for ozone precursors for each of eight categories of vehicles under various conditions affecting in-use emission levels (e.g., ambient temperatures, average traffic speeds, gasoline volatility) as specified by the model user. MOBILE produces the "emission rates" referred to in the previous section.

The model was first developed as MOBILE1 in the late 1970s, and has been periodically updated to reflect the collection and analysis of additional emission factor data over the years, as well as changes in vehicle, engine and emission control system technologies, changes in applicable regulations, emission standards and test procedures, and improved understanding of in-use emission levels and the factors that influence them. Pennsylvania is currently using MOBILE5b as approved by EPA.

PPAQ. Pennsylvania also uses the Post Processor for Air Quality (PPAQ), which consists of a set of programs that perform the following functions:

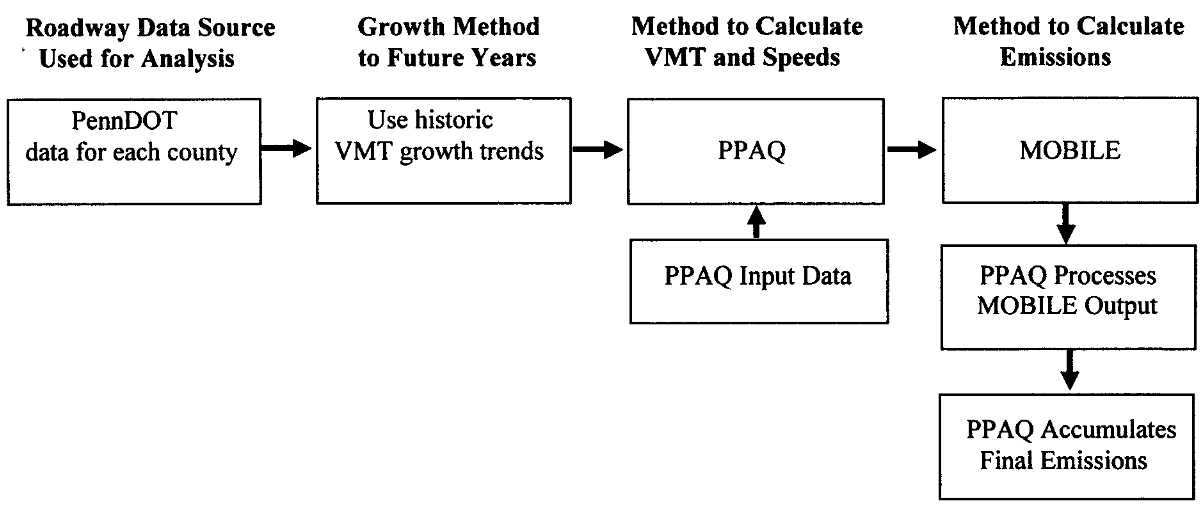
- Analyzes highway operating conditions
- Calculates highway speeds
- Compiles vehicle miles of travel (VMT) and vehicle type mix data
- Prepares MOBILE runs
- Calculates emission quantities from output MOBILE emission rates and accumulated highway VMT.

PPAQ has become a widely used and accepted tool for estimating speeds and processing MOBILE emission rates. It is currently being used for the New York City region, for the north and south New Jersey regions, and in other states including Louisiana, Virginia, and Indiana. The software is based upon accepted transportation engineering methodologies. For example, PPAQ utilizes speed and delay estimation procedures based on planning methods provided in the 1994 Highway Capacity Manual, a report prepared by the Transportation Research Board (TRB) summarizing current knowledge and analysis techniques for capacity and level-of-service analyses of the transportation system.

These two computer programs interact as shown in Exhibit 1.

Exhibit 1

Emission Calculation Process for Pennsylvania



WHERE DOES PENNSYLVANIA OBTAIN ITS DATA?

Data Used in MOBILE

Two major types of information are written into the MOBILE model by EPA: basic emission rates and travel weighting rates. EPA's Office of Mobile Sources obtains this information from a number of sources, including its new vehicle certification program, in-use vehicle random sample studies and special studies (including information from some state I/M programs). For more information on MOBILE, a users guide and various documents (as well as the model itself) are available through EPA's website (http://www.epa.gov/OMSWWW/models.htm).

Basic emission rates are those which are produced under very standardized conditions. The model then modifies (corrects and/or weights) these rates based on other model or input parameters. Rates are incorporated for model year and vehicle type. MOBILE also calculates an assumed amount of increase in emissions as vehicles accumulate mileage.

In addition to exhaust emissions, evaporative VOC emission sources from gasoline-powered vehicles are also included[1]:

- diurnal emissions (evaporated gasoline emissions generated by the rise in temperature over the course of a day when the vehicle is not being driven),
- hot soak emissions (evaporated gasoline emissions occurring after the end of a vehicle trip, due to the heating of the fuel, fuel lines, fuel vapors),
- running loss emissions (evaporated gasoline emissions occurring while a vehicle is driven, due to the heating of the fuel and fuel lines),
- resting loss emissions (small but continuous seepage and minor leakage of gasoline vapor through faulty connections, permeable hoses and other materials in the fuel system).

Evaporative emissions are very dependent on temperature and fuel volatility as well as vehicle model year.

Travel Weighting Fractions. Research has found that newer cars tend to be driven more. The model reflects this, using state-specific vehicle age distributions from registration data. The model also contains assumptions about trips per day and miles per day by age of the vehicle. This is important for exhaust emissions because these emissions are greater when the vehicle is not warmed up (cold start). Also, this information helps characterize evaporative emissions.

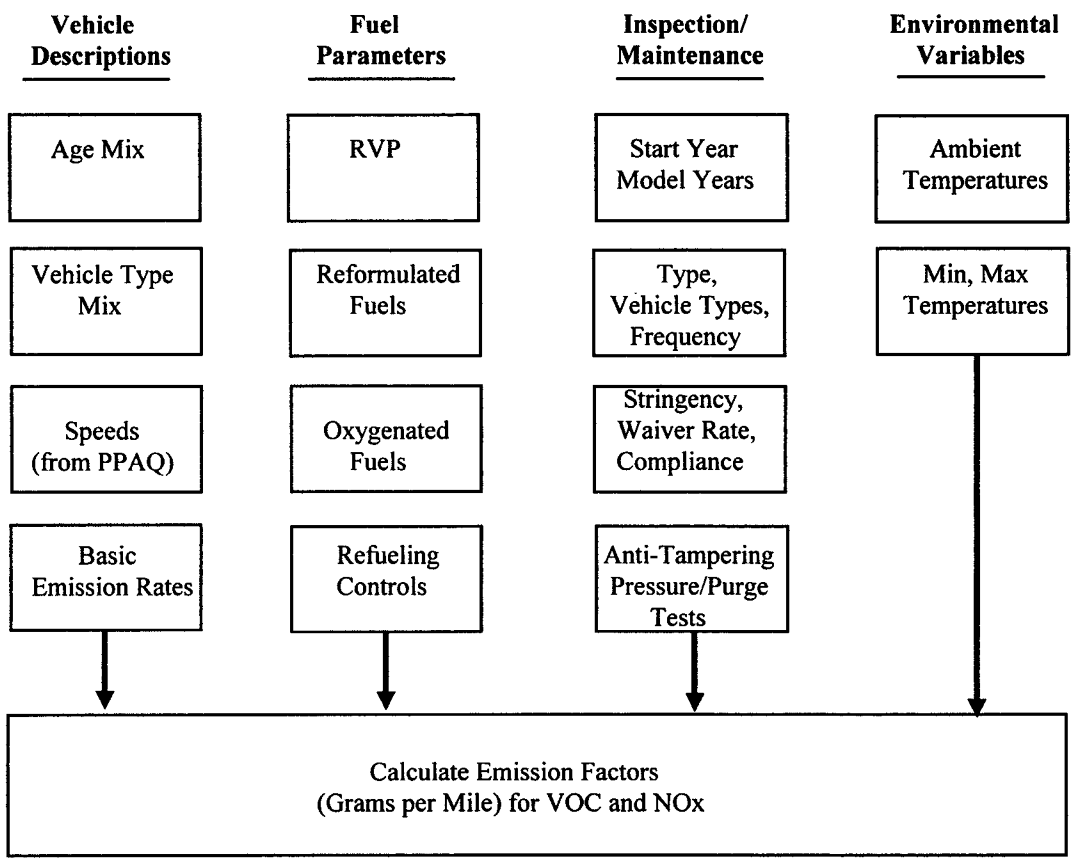
[1] Some states use MOBILE to estimate refueling emissions (gasoline vapor emissions generated by the refueling of vehicles, where in the absence of controls the vapor in the vehicle fuel tank is displaced by the incoming liquid fuel and released to the atmosphere). Pennsylvania includes these emissions in the area source inventory.

What Are The Necessary Data Inputs to MOBILE?

A large number of inputs to MOBILE are needed to fully account for the numerous vehicle and environmental parameters that affect emissions including traffic flow characteristics (as determined from the PPAQ software), vehicle descriptions, fuel parameters, inspection/maintenance program parameters, and environmental variables as shown in Exhibit 2. With some input parameters, MOBILE allows the user to choose default values, while others require area-specific inputs.

Exhibit 2

MOBILE Inputs



For an emissions inventory, area specific inputs are used for all of the inputs shown in Exhibit 2 except for the basic emission rates, which are MOBILE defaults. In addition, Pennsylvania uses MOBILE default cold and hot start fractions (20.6 and 27.3 percent). A vehicle will generate more emissions when it is first operated (cold start). It generates emissions at a different rate when it is stopped and then started again within a short period of time (hot start). Cold/hot start fractions reflect what percent of the VMT was accrued after a cold start and after a hot start.

Vehicle Descriptions. Vehicle age distributions are input to MOBILE for each county based on registered vehicles reflecting July 1 summer conditions. These distributions are obtained from PennDOT's Bureau of Motor Vehicle Registration Database. Vehicle Type Mix is calculated by PPAQ from algorithms using a combination of MOBILE default percentages and PennDOT truck percentages from roadway data. (See also the discussion of Vehicle Type Pattern Data in the next section.) Speeds are discussed extensively in the next section.

Fuel Parameters. The same vehicle will produce different emissions using a different type of gasoline. Fuel control strategies can be powerful emission reduction mechanisms. An important variable in fuels for VOC emissions is its evaporability, measured by Reid Vapor Pressure.

MOBILE allows the user to choose among conventional (used in most of Pennsylvania), federal reformulated (now used in the Philadelphia area), oxygenated (not used in Pennsylvania) and low Reid Vapor Pressure (RVP) gasolines (used in the Pittsburgh area starting in 1998). Pennsylvania chooses the MOBILE inputs appropriate to the year and control strategy for the area being modeled.

MOBILE also allows users to calculate refueling emissions -- the emissions created when vehicles are refueled at service stations. Pennsylvania includes refueling emissions in its area source inventory and not in its highway vehicle inventory. However, that calculation uses a grams per gallon emission rate generated by MOBILE.

Vehicle Emission Inspection/Maintenance (I/M) Parameters. MOBILE allows users to vary inputs depending on the I/M program in place for the area or, of course, choose "no I/M program." The inputs include:

- program start year
- stringency level (failure rate) and pass/fail standards or "cutpoints"
- first and last model years subject to the program
- waiver rates
- compliance rates
- program type (test-only, test-and-repair, etc.)
- frequency of inspection (annual, biennial)
- vehicle type coverage
- test type (idle, loaded, etc.)
- technician training program

Some cutpoints (the emissions at which vehicles are failed) are contained in MOBILE, while others must be put in by the model user. Pennsylvania uses the parameters specific for the geographic area and year for which the modeling is being performed.

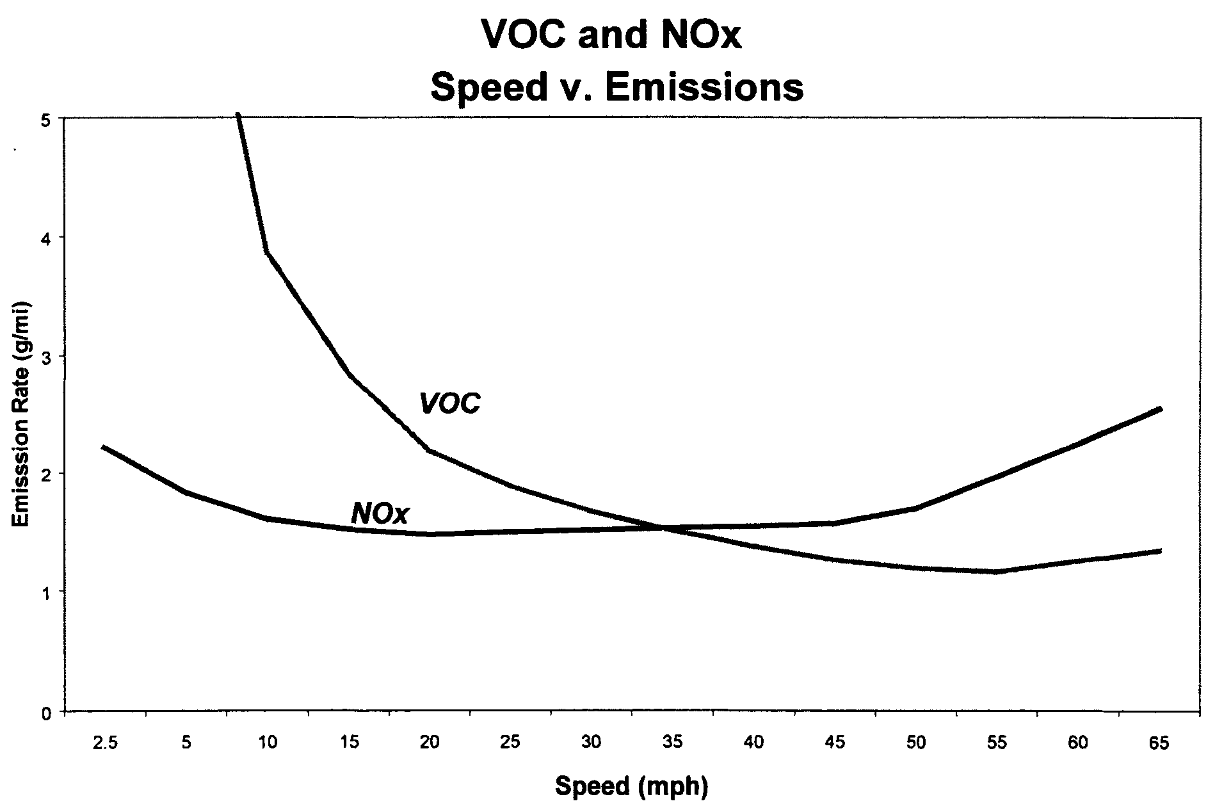
Environmental Variables. Evaporative emissions are influenced significantly by the temperatures of the surrounding air. Minimum, Maximum, and Ambient temperatures have been compiled for each county based on information from EPA's CHIEF bulletin board reflecting airport temperatures on emission violation days.

Emission and Speed Relationships

Of all the user-supplied input parameters, perhaps the most important is vehicle speed. Emissions of both VOC and NOx vary significantly with speed, but the relationships are not linear, as shown in Exhibit 3. While VOCs generally decrease as speed increases, NOx decreases only at the low speed range and increases steeply at higher speeds.

To obtain the best estimate of vehicle speeds, Pennsylvania uses the PPAQ set of programs, whose primary function is to calculate speeds and to organize and simplify the handling of large amounts of data needed for calculating speeds and for preparing MOBILE input files.

Exhibit 3



PPAQ can also provide a link between transportation and air quality models, enabling models like MOBILE to take advantage of the wealth of information generated by transportation models in a form which is relevant for air quality. Transportation models are presently used in the Philadelphia and Pittsburgh areas and are being incorporated into the transportation planning process in other metropolitan areas in the Commonwealth.

Roadway Data

The roadway data input to emissions calculations for Pennsylvania uses information from the Roadway Management System (RMS) maintained by PennDOT's Bureau of Planning and Research. PennDOT obtains this information from periodic visual and electronic traffic counts. RMS data is dynamic since it is continually reviewed and updated from new traffic counts and field visits conducted by PennDOT. Information on roadways included in the National Highway System is reviewed at least annually, while information on other roadways is reviewed at least biennially.

Periodically, a current "snapshot" of the RMS database is taken and downloaded to provide an up-to-date record of the Commonwealth's highway system for estimating emissions.

The RMS database contains all state highways, including the Pennsylvania Turnpike, divided into segments approximately 0.5 miles in length. These segments are usually divided at important intersections or locations where there is a change in the physical characteristics of the roadway (e.g. the number of lane changes). There are approximately 99,000 state highway segments for the 67 Pennsylvania counties contained in the RMS. Each of these segments contains an abundance of descriptive data, but only the following information is extracted for emission calculations:

- Lanes
- Distances
- Volumes in Average Annual Daily Traffic (AADT)
- Truck percentages
- PennDOT urban/rural classifications
- PennDOT functional class codes

RMS volumes and distances are used in calculating highway VMT totals for each county. As discussed in the next section, adjustments are needed to convert the volumes to an average July weekday. Lane values are an important input for determining the congestion and speeds for individual highway segments. Truck percentages are used in the speed determination process and are used to split volumes to individual vehicle types used by the MOBILE software.

Pennsylvania classifies its road segments by function, as well as whether it is located in an urban, small urban or rural area, as indicated below in Exhibit 4. The PennDOT urban/rural (UR) and functional classes (FC) are important indicators of the type and function of each roadway segment. The variables provide insights into other characteristics not contained in the RMS data that are used for speed and emission calculations. In addition, VMT and emission quantities are aggregated and reported using both UR and FC codes.

Exhibit 4

PennDOT Classification Scheme: Urban/Rural Codes and Functional Class Codes

Urban/Rural Code	1=Rural 2=Small Urban 3=Urban	
Functional Class	Rural Functional Classes Used For Rural Areas	Urban Functional Classes Used For Small Urban and Urban Areas
	1=Rural Freeway	11=Urban Freeway
	2=Rural Other Principal Arterial	12=Urban Expressway
	6=Rural Minor Arterial	14=Urban Principal Arterial
	7=Rural Major Collector	16=Urban Minor Arterial
	8=Rural Minor Collector	17=Urban Collector
	9=Rural Local	19=Urban Local

Note: Functional Classes 3,4,5,10,13,15,18 are not currently used in PennDOT's RMS database

Additions and Adjustments to Roadway Data

Before the RMS data can be used by PPAQ for speed and emission calculations, several adjustments and additions must be made to the roadway data.

1990 HPMS Adjustments: According to EPA guidance, baseline inventory VMT computed from the RMS highway segment volumes must be adjusted to be consistent with Highway Performance Monitoring System (HPMS) VMT totals. The HPMS VMT reported for Pennsylvania is a subsystem of the RMS established to meet the data reporting requirements of the Federal Highway Administration (FHWA) and to serve as PennDOT's official source of highway information. Although it has some limitations, the HPMS system is currently in use in all 50 states and is being improved under FHWA direction.

The HPMS VMT totals are developed from the data contained in the RMS database at the time of reporting and serves as a "snapshot" of the RMS data for a particular year. Since the RMS database does not contain many local roads, a separate procedure is used by PennDOT to estimate total local VMT for the HPMS system. HPMS VMT summaries are prepared each year and reported by PennDOT urban/rural and functional class codes. The VMT contained in the HPMS reports are considered to represent average annual daily traffic (AADT).

Although the HPMS VMT and the roadway data used for an inventory emissions analysis are both based on data from the RMS system, differences do exist between them and include the following. First, the HPMS and inventory roadway data are "snapshots" of the RMS data taken at different times. Since the RMS is dynamic, changing constantly due to new data, differences will result between the data used for calculating HPMS VMT totals and the inventory data used for an emissions analysis. Second, local estimates of HPMS VMT are obtained through alternative procedures developed by PennDOT. However, the emissions inventory makes use of those few local roads contained in the RMS system. To account for such differences, adjustment factors are calculated and used to adjust the inventory roadway data to the reported HPMS VMT totals submitted to FHWA.

Adjustment factors are calculated which adjust the 1990 RMS VMT to be consistent with 1990 HPMS totals. These factors are developed for each county, urban/rural code, and functional class combination and are also applied to all future year runs. Adjustments for the "higher" functional classes (e.g. Freeway, Arterials - major routes) were very close to 1.000 since HPMS VMT is derived from RMS information, and the only difference in the data is that the "snapshot" for the emission calculations is taken at a different time than for the HPMS. "Lower" classes (e.g. local roads) require greater adjustment since a large part of the local system is not under state jurisdiction and is not in the RMS database. There is, of course, a significant amount of local road mileage in the state. It is assumed that those local streets that are in RMS are representative of all local streets in their area with respect to volume and speed, so that roadway mileage adjustment is appropriate.

The adjustment factors calculated above are applied by PPAQ during each run. The factors developed for the 1990 volumes are also used for any future year runs.

Seasonal Adjustments to Volumes: The RMS contains AADT volumes that are an average of all days in the year including weekends and holidays. An ozone emission analysis, however, is based on a typical July weekday. Therefore, those volumes must be seasonally adjusted. Seasonal factors were developed for each functional class and urban/rural code based on yearly count information prepared by PennDOT's Bureau of Planning and Research. These factors are applied to the existing RMS AADT volumes to produce the July volumes.

Additional Network Information: The PPAQ software system allows for many additional variables other than those available in the RMS database. Using these variables improves the ability of Pennsylvania to incorporate real roadway conditions into its estimates. The variables include information regarding signal characteristics and other physical roadway features that can affect a roadway's calculated congested speed. PPAQ's ability to estimate congested speeds by road segment improves Pennsylvania's emissions inventories because of the overwhelming role speed plays in emission rates. If specific information regarding these variables is known or obtained for areas, this information can be appended to the RMS database. Otherwise, default values are assumed based on information provided by the PPAQ input speed/capacity lookup data as described below.

Speed/capacity lookup data provides PPAQ with initial (free-flow with no congestion) speeds and capacities for different urban/rural code and functional class groupings. The initial speeds and capacities are used by PPAQ in determining the final congested speed for each roadway segment. Speeds can also be greatly impacted by signals and other roadway features. As a result, this data provides default signal densities (average number of signals per mile for different functional classes) as well as default values for variables that determine the decay of speed with varying levels of congestion. As discussed above, values from the speed/capacity data can be overridden for specific links by directly coding values to the roadway database segments. The speed capacity data was developed from a combination of sources including the following:

- Information contained in the 1994 Highway Capacity Manual
- PennDOT information on speeds and signal densities
- Engineering judgment

24-hour Pattern Data: Speeds and emissions vary considerably depending on the time of day (because of temperature) and congestion. Therefore, it is important to estimate the pattern by which roadway volume varies by hour of the day. The 24-hour pattern data provides PPAQ with information used to split the daily roadway segment volumes to each of the 24 hours in a day. Pattern data is in the form of a percentage of the daily volumes for each hour. Distributions are provided for each county and functional class grouping. This data was developed from 24-hour count data compiled by PennDOT's Bureau of Planning and Research, according to the process in Procedures for Adjusting Traffic Count Data, 1991.

Vehicle Type Pattern Data: Basic emission rates may differ by vehicle type. These types are listed below in Exhibit 5.

Exhibit 5

MOBILE Vehicle Types

1.	LDGV	- Light-Duty Gasoline Vehicles
2.	LDGT1	- Light-Duty Gasoline Trucks (<6,500 lbs)
3.	LDGT2	- Light-Duty Gasoline Trucks (<8,500 lbs)
4.	HDGV	- Heavy-Duty Gasoline Vehicles (>8,500 lbs)
5.	LDDV	- Light-Duty Diesel Trucks (<8,500 lbs)
6.	LDDT	- Light-Duty Diesel Trucks (<8,500 lbs)
7.	HDDV	- Heavy-Duty Diesel Vehicles (>8,500 lbs)
8.	MC	- Motorcycles

MOBILE summary reports by vehicle type are also useful in knowing what kinds of vehicles generate emissions. The vehicle type pattern data is used by PPAQ to divide the hourly roadway segment volumes to the eight MOBILE vehicle types. Similar to the 24-hour pattern data, this data contains percentage splits to each vehicle type for every hour of the day. The vehicle type pattern data was developed from several sources of information:

- Hourly distributions for trucks and total traffic compiled by PennDOT's Bureau of Planning and Research, according to Procedures for Adjusting Traffic Counts, 1991
- PennDOT truck percentages from the RMS database
- MOBILE default vehicle type breakdowns

The vehicle type pattern data is developed for each county and functional class combination. First, RMS truck percentages are averaged for all roadways within a county, functional class grouping. Using this percentage data, the total roadway volume for any segment could be divided to both auto and truck vehicle type categories. However, these percentages do not yet enable volumes to be divided to each of the eight MOBILE vehicle types. As a result, MOBILE default vehicle type breakdowns are then used to divide the auto and truck percentages, calculated above, to each specific MOBILE vehicle type. PennDOT hourly distributions for trucks and total traffic are then used to create vehicle type percentage breakdowns for each hour of the day.

Vehicle Type Capacity Analysis Factors: Vehicle type percentages are provided to the capacity analysis section of PPAQ to adjust the speeds in response to trucks. That is, a given number of larger trucks take up more roadway space than a given number of cars, and this must be accounted for in the model. Capacity is adjusted based on the factors provided in this data. Values are developed from information in the 1994 Highway Capacity Manual and are specific to the various facility types.

Producing Future Year Volumes

Growth factors are used to project future highway volumes from the volumes provided in the RMS database. Separate factors are derived for each county and highway functional class from an analysis of historic HPMS growth trends, coupled with estimates of population and employment growth from the U.S. Department of Commerce's Bureau of Economic Analysis (BEA). The factors are then applied to base year traffic volumes on each highway segment in the RMS network database.

The Pittsburgh and Philadelphia regions, however, use a different approach for determining future year volumes, since the larger metropolitan areas are required to use more sophisticated projection methods for transportation planning. These areas currently have traffic forecasting models in place as required by US Department of Transportation; VMT estimates for base and future years are obtained from the model runs. From these VMT estimates, growth factors are prepared which are then applied to the RMS database volumes similar to other regions in Pennsylvania.

SPEED/EMISSION ESTIMATION PROCEDURE

The previous sections have summarized the input data used for computing speeds and emission rates for Pennsylvania. This section explains how PPAQ and MOBILE use that input data to produce emission estimates. Exhibit 6 on the following page summarizes PPAQ's analysis procedure used for each of the 99,000 highway segments in the state.

Producing an emissions inventory with PPAQ requires a process of disaggregation and aggregation. Data is available and used on a very small scale -- individual ½ mile roadway segments 24 hours of the day. This data needs to first be aggregated into categories so that a reasonable number of MOBILE scenarios can be run, and then further aggregated and/or re-sorted into summary information that is useful for emission inventory reporting.

Volume/VMT Development

Before speeds can be calculated and MOBILE run, volumes acquired from RMS must be adjusted and disaggregated. Such adjustments include factoring to future years, seasonal adjustments, and disaggregating daily volumes to each hour of the day and to each of the eight MOBILE vehicle types.

Future Year Volumes: The RMS database contains up-to-date current year volumes. However, to conduct a future year analysis, these volumes must be factored to the year being analyzed. Growth factors have been prepared based on historic HPMS trends coupled with population and employment forecasts for each county, urban/rural area code, and functional class grouping. These growth factors are applied to the base year RMS volumes to obtain future year estimates that can be utilized by PPAQ.

Example:

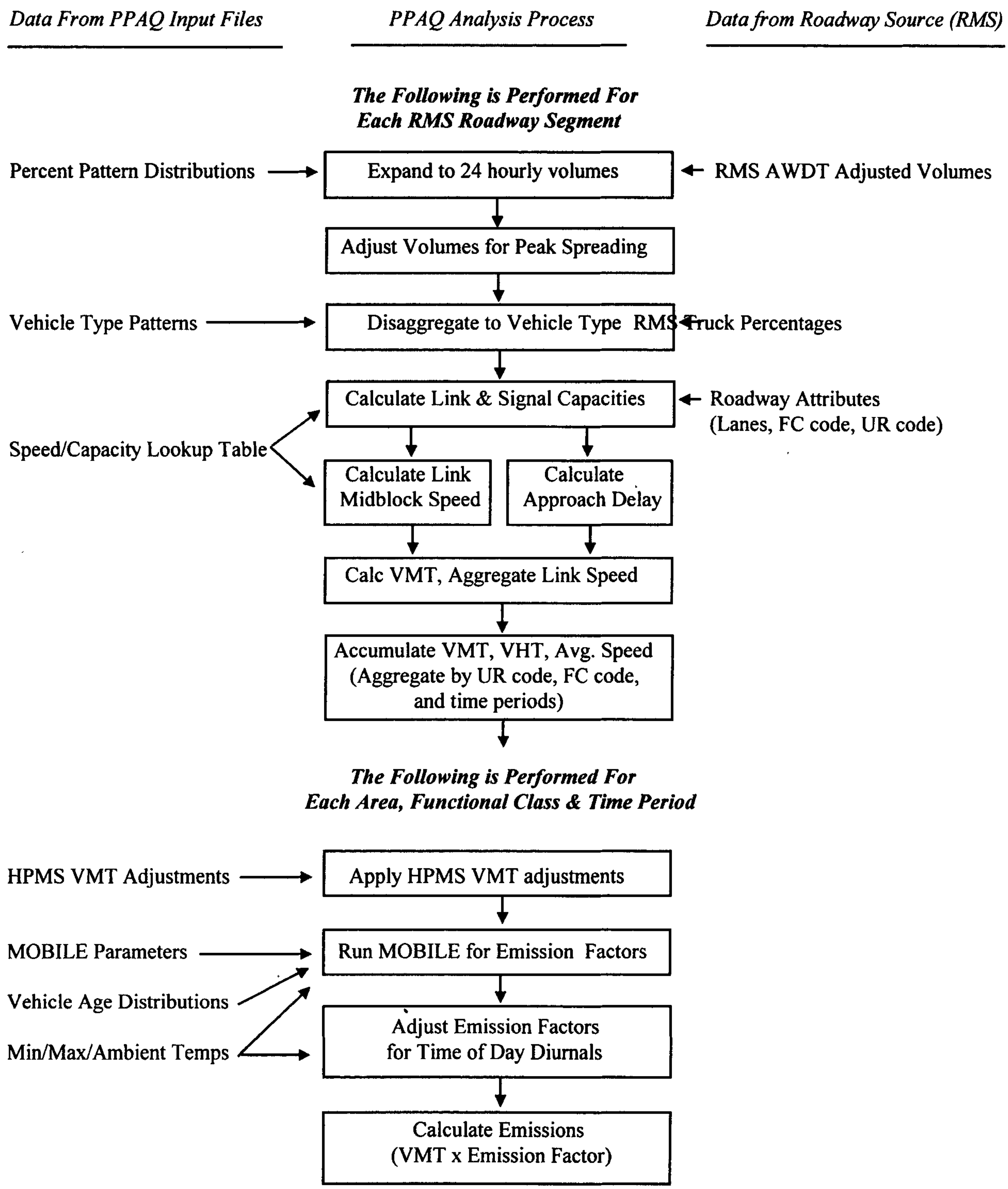
A typical freeway link in the RMS database is I-80 segment 2500 in Luzerne County, Pennsylvania. This link has an urban/rural code=1 which indicates the link is in a rural area, and a functional class=1 indicating a rural freeway. The average annual daily traffic (AADT) from the RMS database for this link in 1990 is 12,077 vehicles/day.

Growth factors have been developed to factor the 1990 volume to future years. For example, to factor the 1990 volume to the year 2002, a factor of 1.282 has been developed for Luzerne County rural freeways.

2002 volume = 12,077 vehicles/day x 1.282 = 15,483 vehicles/day

Exhibit 6

PPAQ Speed/Emission Estimation Procedure



Seasonal Adjustments: PPAQ takes the input daily volumes from RMS which represent AADT and seasonally adjusts the volumes to an average weekday in July. This adjustment utilizes factors developed for each functional class and urban/rural code. VMT can then be calculated for each link using the adjusted weekday volumes.

Example:

Again, assume the rural freeway link: I-80 segment 2500 in Luzerne County, Pennsylvania. The average annual daily traffic (AADT) for this link in 1990 is 12,077 vehicles/day.

Seasonal factors have been developed for urban/rural code and functional class combinations. For an urban/rural code=1 and a functional class=1, the factor to convert from AADT to an average weekday in July is = 1.15

Average Weekday July Volume = 12,077 x 1.15 = 13,889 vehicles/day

Total VMT (daily) for this link is calculated as volume x distance. The distance of this link as obtained from RMS is 0.286 miles.

1990 VMT = 13,889 vehicles/day x 0.296 miles = 41,111 vehicle-miles / day

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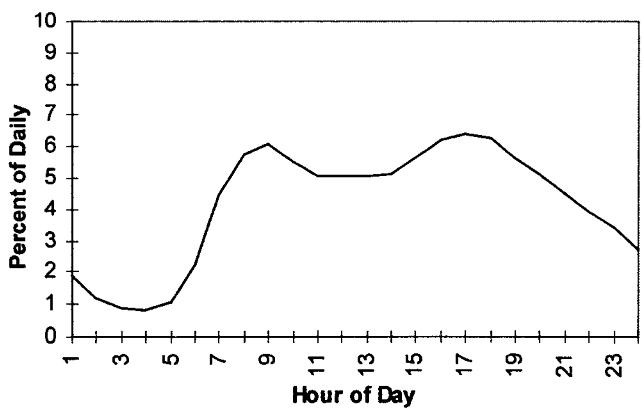
Disaggregation to 24 Hours: After seasonally adjusting the link volume, the volume is split to each hour of the day. This allows for more accurate speed calculations (effects of congested hours) and allows PPAQ to aggregate VMT and speeds to different time periods for purposes of running MOBILE scenarios and reporting emissions.

Example:

To support speed calculations and emission estimates by time of day, the July weekday volume is disaggregated to 24 hourly volumes. Temporal patterns were previously developed from PennDOT count data and input to PPAQ. For the I-80 rural freeway link with morning peak volumes similar to evening peak hours (neutral), the following temporal pattern is applied:



Using the I-80 segment for 1990, typical hourly volumes which result include:

8-9 a.m.	6.0% x (41,111 vehicle miles/ 0.296mi.) = 833 vehicles/hour (vph)
12-1 p.m.	5.0% x (41,111 vehicle .miles/ 0.296mi.) = 694 vph
5-6 p.m.	6.3% x (41,111 vehicle miles/ 0.296mi.) = 875 vph

After dividing the daily volumes to each hour of the day, PPAQ identifies hours that are overly congested. For those hours, PPAQ then spreads a portion of the volume to other hours within the same peak period, thereby approximating the "peak spreading" that normally occurs in such over-capacity conditions.

Disaggregation to Vehicle Type: EPA requires VMT estimates to be prepared by vehicle type, reflecting specific local characteristics. As a result, for Pennsylvania's emission inventory, the hourly volumes are disaggregated to the eight MOBILE vehicle types based on count data assembled by PennDOT.

Example:

Disaggregation of the total I-80 volume (by hour) to the various vehicle types would include the following:

Total Volume 8-9 am = 833 vph

Vehicle Type Volume 8-9 am:

LDGV	54.1%	451 vph
LDGT1	19.7%	164 vph
LDGT2	13.8%	115 vph
HDGT	2.7%	22 vph
LDDV	2.3%	19 vph
LDDT	1.8%	15 vph
HDDV	4.8%	40 vph
MC	0.8%	7 vph

Speed/Delay Determination

EPA recognizes that the estimation of vehicle speeds is a difficult and complex process. Because emissions are so sensitive to speeds, it recommends special attention be given to developing reasonable and consistent speed estimates; it also recommends that VMT be disaggregated into subsets that have roughly equal speed, with separate emission factors for each subset. At a minimum, speeds should be estimated separately by roadway functional class. The computational framework used for this analysis meets and exceeds that recommendation: Speeds are individually calculated for each roadway segment and hour and incorporate the delays encountered at signals. VMT and vehicle hours of travel (VHT) are then accumulated for each cell of the county/functional class/time of day matrix; accumulated VMT is divided by VHT to produce the cell's average speed.

To calculate speeds, PPAQ first obtains initial capacities (how much volume the roadway can serve before heavy congestion) and free-flow speeds (speeds assuming no congestion) from the speed/capacity lookup data. As described in previous sections, this data contains default roadway information indexed by the urban/rural code and functional class. For areas with known characteristics, values can be directly coded to the RMS database and the speed/capacity data can be overridden. However, for most areas where known information is not available, the speed/capacity lookups provide valuable default information regarding speeds, capacities, signal densities and characteristics, and other capacity adjustment information used for calculating congested delays and speeds.

Example:

The speed/capacity lookup table is used to obtain important data used for link speed calculations. For the I-80 link with an urban/rural code = 1 (rural) and a functional class = 1 (freeway), the lookup table provides information including the following:

freeflow speed = 65 mph
capacity = 1800 vph per lane
number of signals = 0

This information is used along with the physical characteristics of the roadway to calculate the delay (including congestion) to travel this link during each hour of the day:

For example: The I-80 link is calculated to have a travel time, including delay of 17.76 seconds for the 8-9am hour

Total travel time, in vehicle hours, for the 8-9am hour is calculated as:

VHT (8-9am) = 17.76 seconds x 833vph / 3600 sec/hr = 4.12 vehicle hours

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The result of this process is an estimated average travel time for each hour of the day for each highway segment. The average time can be multiplied by the volume to produce vehicle hours of travel (VHT).

HPMS and VMT Adjustments

Volumes must also be adjusted to account for differences with the HPMS VMT totals, as described previously. VMT adjustment factors are provided as input to PPAQ, and are applied to each of the roadway segment volumes. These factors were developed from 1990 data; however, they are also applied to any future year runs. The VMT added or subtracted to the RMS database assumes the speeds calculated using the original volumes for each roadway segment for each hour of the day.

Example:

Using the Luzerne County I-80 rural freeway link example, the daily assigned volume is adjusted to account for reconciliation with the HPMS VMT. RMS VMT (in AADT) for Luzerne County rural freeways totals 962,559 vehicle miles in 1990. HPMS VMT (in AADT) as supplied by PennDOT and reported to FHWA totals to 990,088 vehicle miles for the rural freeways. A factor is developed by dividing the HPMS VMT by the RMS VMT:

HPMS adjustment factor for Luzerne County rural freeways = 990,088 / 962,559 = 1.029

This factor is held constant in all future years. As an example, this adjustment is made to the I-80 freeway link VMT for the 8-9am hour after speed calculations are made, and produces the final July weekday VMT for this hour used for Ozone runs.

I-80 Link VMT (8-9am) = 833vph x 0.296 miles x 1.029 = 254 vehicle miles

VMT and Speed Aggregation

While highway volumes, vehicle mixes, and speeds are calculated on the basis of individual highway segments and hours, this data is far too disaggregate to apply directly to MOBILE. Therefore, PPAQ has been set up to automatically accumulate VMT and VHT by larger geographic areas, highway functional class, and time periods as shown in Exhibit 7.

Exhibit 7

VMT/VHT Aggregation Scheme

County			67 entries
Urban/Rural Code	1=Rural 2=Small Urban 3=Urban		
Functional Class	1=Rural Freeway 2=Rural Other Principal Arterial 6=Rural Minor Arterial 7=Rural Major Collector 8=Rural Minor Collector 9=Rural Local	11=Urban Freeway 12=Urban Expressway 14=Urban Principal Arterial 16=Urban Minor Arterial 17=Urban Collector 19=Urban Local	18 entries
Time Periods	AM Peak Period (7:00 to 10:00 AM) Midday (10:00 AM to 4:00 PM) PM Peak Period (4:00 to 6:00 PM) Night (6:00 PM to 7:00 AM)		4 entries
			4,824 potential combinations

Geographic aggregation is performed by urban, small urban, and rural areas of each county. Functional class aggregation is according to PennDOT's eighteen standard functional classes, respecting urban, small urban and rural definitions. Time period aggregation is according to AM peak, PM peak, Midday, and Night as defined in Exhibit 6. For an individual county, this creates a potential for 72 possible combinations, each of which becomes an input MOBILE scenario. This allows each MOBILE scenario to represent the actual VMT mix, speed, and potentially cold/hot start fraction for that geographic / highway / time combination. Altogether then, there are potentially 4,824 combinations for which speeds and VMT are computed and emissions are calculated with MOBILE.

Once all links are processed and VMT and VHT accumulated, average speeds are calculated for each cell of the accumulation matrix by dividing VMT by VHT. This speed is then input to the MOBILE scenario as the average speed for that cell.

Example:

The hourly VMT and VHT quantities are accumulated into a matrix of VMT and VHT for each combination of county, urban/rural code, functional class, and time period.

For this example, Luzerne County rural freeways during the morning peak period (7-10am) will carry 155,904 vehicle miles of travel, and will involve 2,399 vehicle hours of travel. Dividing the accumulative VMT by the cumulative VHT produces the average operating speed for this cell:

Average speed = VMT / VHT = 155,904 / 2,399 = 64.9 mph

Thus the Luzerne County rural freeways will operate at an average speed of 65.0 mph during the morning peak period. Overall, on a 24-hour basis the total VMT for Luzerne rural freeways will be 1,148,251 vehicle miles, and the average travel speed will be 65.0 miles per hour.

MOBILE Emissions Run

After computing speeds and aggregating VMT and VHT, PPAQ prepares input files to be run in EPA's MOBILE program which is used to produce VOC and NOx emission factors in grams of pollutant per vehicle mile. The process uses an unmodified version of the MOBILE program that was obtained directly from EPA.

The MOBILE input file prepared by PPAQ contains the following:

- MOBILE template containing appropriate parameters and program flags
- Temperature data specific to the county being run
- Vehicle age data for the county being run
- Scenario data - contains VMT mix, average speeds specific to scenario as produced by PPAQ

Example:

A MOBILE input file is created by PPAQ for Luzerne County. This file contains separate scenarios for each urban/rural code, functional class, and time period combination. A scenario represents a separate MOBILE run with different emission factors calculated and output for each run.

For this example, Luzerne County rural freeways during the morning peak period (7-10am) will be run as a scenario. Specific data including temperature data, vehicle mix data, and speeds are supplied by PPAQ for this morning period scenario.

Time of Day and Diurnal Emissions

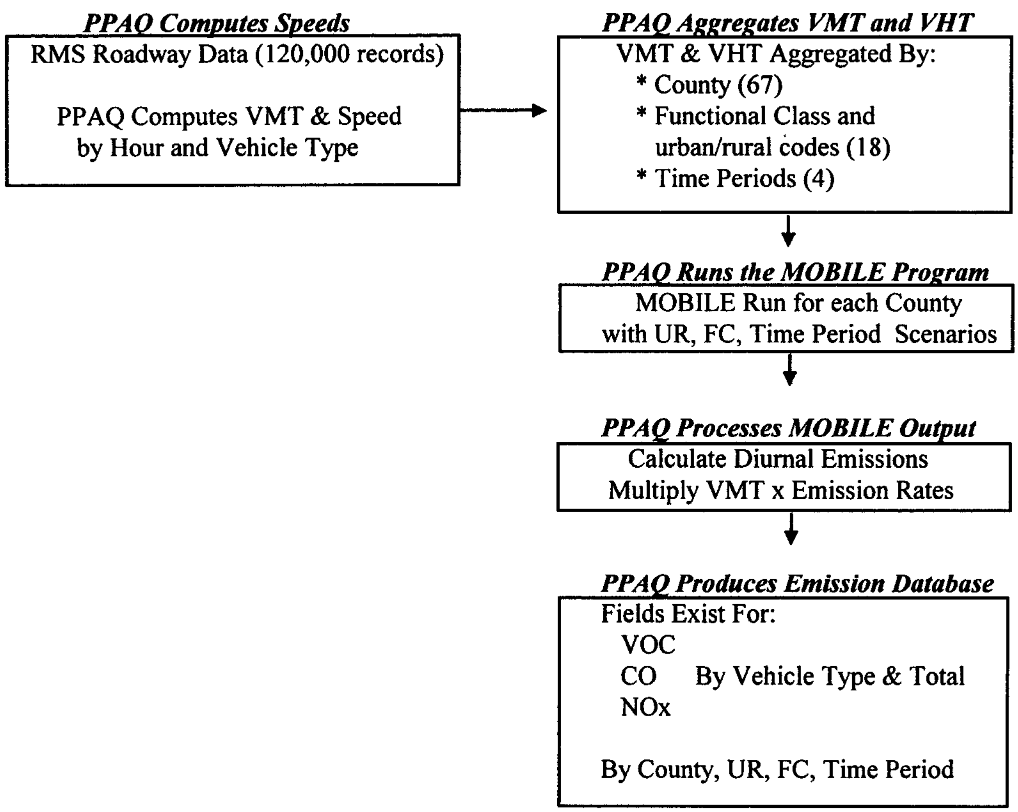
The highway system VMT and speeds are aggregated according to four time periods. Because diurnal emissions are calculated by MOBILE on the basis of 24-hour minimum-to-maximum temperatures, special processing is needed to accurately estimate the emissions component by allocating daily diurnal emissions to the various time periods. This is done within the computational process by adjusting the emission factors for each time period to correctly account for that time period's share of the daily diurnal emissions.

Process MOBILE Output

After MOBILE has been run, PPAQ processes the MOBILE output files and compiles the emission factors for each scenario. Using the above methodology, it allocates daily diurnal emissions to each of the time periods. Using the MOBILE emission factors, PPAQ calculates emission quantities by multiplying the emission factors by the aggregated VMT totals. PPAQ then produces an emissions database summarizing VMT, VHT, VOC, and NOx emissions as shown in Exhibit 8.

Exhibit 8

Summary of PPAQ's Methodology in Producing Emissions Summary



Example:

Luzerne County rural freeways during the morning peak period (7-10am) were run as a scenario in MOBILE. Based on the input information, MOBILE outputs emission factors by vehicle type for this scenario as shown below:

Composite Emission Factors (grams/mile) from MOBILE output

Vehicle Type:	LDGV	LDGT1	LDGT2	HDGT	LDDV	LDDT	HDDV	MC
VOC:	1.22	1.86	2.42	3.68	0.36	0.54	1.13	4.53
NOX:	2.41	3.16	3.66	7.14	1.84	4.15	5.84	8.71

PPAQ reads these emission factors from the MOBILE output file and multiplies them by the Luzerne County morning peak period rural freeway VMT to obtain emission totals for this scenario. (Note: emissions shown in kg/day which is converted to tons/day in SIP narratives)

PPAQ computes emissions as follows for this scenario:

			Emission Factors (g/mi)			**Emissions (kg/day)**	
Veh Type	**VMT**		**VOC**	**NOX**		**VOC**	**NOX**
LDGV	84,344	x	1.22	2.41	=	102.9	203.3
LDGT1	30,713	x	1.86	3.16	=	57.1	97.1
LDGT2	21,515	x	2.42	3.66	=	52.1	78.7
HDGT	4,209	x	3.68	7.14	=	15.5	30.1
LDDV	3,586	x	0.36	1.84	=	1.3	6.6
LDDT	2,806	x	0.54	4.15	=	1.5	11.6
HDDV	7,483	x	1.13	5.84	=	8.5	43.7
MC	1,248	x	4.53	8.71	=	5.7	10.9
Total	155,903					244.6	482.0

The emissions for this scenario are reported and stored in an output database file which contains a record for each scenario with fields containing VMT, VHT, VOC emissions, and NOX emissions. Fields exist for each vehicle type and for the total of all vehicle types as shown below.

Reported by Vehicle Type 1-8 and Total --- Repeated for VHT,HC,NOX

Cnty	**UR**	**FC**	**Time**	**VMT1**	**VMT2**	**VMT3**	**VMT4**	**VMT5**	**VMT6**	**VMT7**	**VMT8**	**VMTtot**
Luze	1	1	AM	84,344	30,713	21,515	4,209	3,586	2,806	7,483	1,248	155,903

VHT1	**VHT2**	**VHT3**	**VHT4**	**VHT5**	**VHT6**	**VHT7**	**VHT8**	**VHTtot**
1,298	473	331	65	55	43	115	19	2,399

VOC1	**VOC2**	**VOC3**	**VOC4**	**VOC5**	**VOC6**	**VOC7**	**VOC8**	**VOCtot**
102.9	57.1	52.1	15.5	1.3	1.5	8.5	5.7	244.6

NOX1	**NOX2**	**NOX3**	**NOX4**	**NOX5**	**NOX6**	**NOX7**	**NOX8**	**NOXtot**
203.3	97.1	78.7	30.1	6.6	11.6	43.7	10.9	482.0

RESOURCES

MOBILE model

Modeling Page within EPA's Office of Mobile Sources Website (http://www.epa.gov/otaq/models.htm) contains a downloadable model, MOBILE users guide and other information.

"AP-42" document, "Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources," as updated by Supplement A (January 1991), available in hard-copy only. This material is also in the process of being revised and updated. Contact AP-42 Project, Test and Evaluation Branch, EPA, 2565 Plymouth Road, Ann Arbor, MI 48105.

Highway Vehicle Emission Estimates (June 1992) and *Highway Vehicle Emission Estimates II* (May 1995) discusses how EPA obtains data for MOBILE and some of the shortcomings in earlier models. Similar discussions of the present version's shortcomings are discussed in papers available at the website.

"MOBILE5, Information Sheet #5, Inclusion of New 2004 NOx Standard for Heavy-Duty Diesel Engines in MOBILE5a and MOBILE5b Modeling," US EPA, January 30, 1998.

"MOBILE5, Information Sheet #6, Effects of the New National Low Emission Vehicle Standard for Light-Duty Gasoline Fueled Vehicles," US EPA, July 1998.

"MOBILE5, Information Sheet #7, NOx Benefits of Reformulated Gasoline Using MOBILE5a," US EPA, September 1998.

"MOBILE5, Information Sheet #8, Tier 2 Benefits Using MOBILE5," USEPA, April 2000.

Traffic Engineering

1994 Highway Capacity Manual, Transportation Research Board, presents current knowledge and techniques for analyzing the transportation system.

Procedures for Adjusting Traffic Count Data, 1991 edition, Pennsylvania Department of Transportation, Bureau of Planning and Research

Traffic Data Collection and Factor Development Report, 1996 Data, Pennsylvania Department of Transportation, Bureau of Planning and Research.

Highway Vehicle Inventory Glossary

AADT: Average Annual Daily Traffic, average of ALL days.

AWDT: Average Weekday Daily Traffic

Basic emission rates: MOBILE emission rates based on the applicable Federal emission standards and the emission control technologies characterizing the fleet in various model years.

Cold start: parameter in MOBILE that accounts for additional emissions resulting from a cold-started engine.

Diurnals: the pressure-driven evaporative HC emissions resulting from the daily increase in temperature

Emission rate or factor: expresses the amount of pollution emitted per unit of activity. For highway vehicles, usually in grams of pollutant emitted per mile driven.

FC: Functional code, applied in data management to road segments to identify their type (freeway, local, etc.)

Fuel volatility: The ability of fuel components to evaporate, thus entering the atmosphere as pollution. Fuel volatility is usually measured as Reid Vapor Pressure (RVP) in pounds per square inch. The lower the RVP, the less volatile the fuel.

Growth factor: Factor used to convert volumes to future years

HPMS: Highway Performance Monitoring System, PennDOT's official source of highway information and a subset of RMS.

I/M: Vehicle emissions inspection/maintenance programs ensure that vehicle emission controls are in good working order throughout the life of the vehicle. The programs require vehicles to be tested for emissions. Most vehicles that do not pass must be repaired.

MOBILE: The model EPA has developed and which Pennsylvania uses to estimate emissions from highway vehicles.

Pattern data: Extrapolations of traffic patterns (such as how traffic volume on road segment types varies by time of day, or what kinds of vehicles tend to use a road segment type) from segments with observed data to similar segments.

Program flag: In MOBILE, a numeric code which tells the program such things as how data will be provided by user (or whether default will be used) or how to tailor outputs.

PPAQ: Post-Processor for Air Quality, a set of programs that estimate speeds and processes MOBILE emission rates.

RMS: Roadway Management System, a database maintained by PennDOT from traffic counts and field visits

Scenario: a MOBILE run with a specific set of geographical, time period, highway facility and control strategy assumptions.

Segment: (referred to as link) division of roadway in the PennDOT Roadway Management System. Usually represents 0.5 mile segments of roadway.

UR: Urban/rural code, applied in data management to identify whether a road segment is urban, small urban or rural.

VHT: vehicle hours traveled.

VMT: vehicle miles traveled. In modeling terms, it is the simulated traffic volumes times link length.

Vehicle Type: One of eight types, distinguished primarily by fuel type and/or weight, used in MOBILE modeling.